RBI®

FUTERA XLF

Finned copper tube Gas boilers (MB) & Water heaters (MW)

Boiler manual

Installation and operation instructions

Also read and follow:

XLF HeatNet Control manual

HeatNet On Board™

WARNING This manual is intended only for use by a qualified heating installer/technician. Read and follow this manual, all supplements and related instructional information provided with the boiler. Install, start and service the boiler only in the sequence and methods given in these instructions. Failure to do so can result in severe personal injury, death or substantial property damage.

WARNING **Do not use the boiler during construction.** Construction dust and particulate, particularly drywall dust, will cause contamination of the burner, resulting in possible severe personal injury, death or substantial property damage. The boiler can only be operated with a dust-free air supply. Follow the instruction manual procedures to duct air to the boiler air intake. If the boiler has been contaminated by operation with contaminated air, follow the instruction manual guidelines to clean, repair or replace the boiler if necessary.

CAUTION Affix these instructions near to the boiler. Instruct the building owner to retain the instructions for future use by a qualified service technician, and to follow all guidelines in the User's Information Manual.

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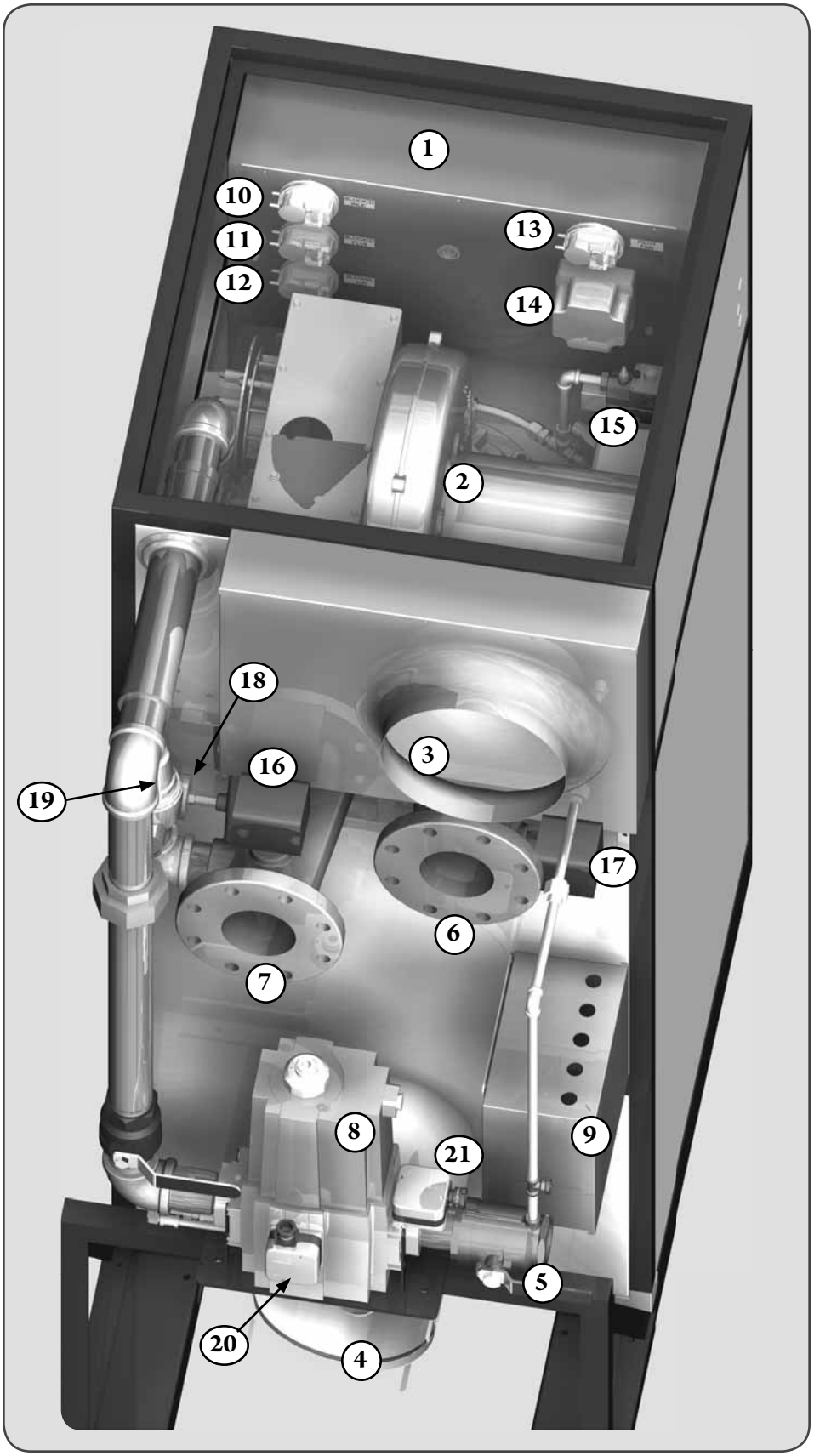
RBI Futera *XLF*-Series boilers — Overview

XLF PRIMARY COMPONENTS

1. Electrical enclosure (rear)
2. Blower and motor
3. Air inlet connection
4. Flue outlet connection
5. Gas entrance
6. Boiler water return
7. Boiler water supply
8. Gas valve
9. Power entrance box
10. DP switch — blocked air inlet
11. DP switch — blocked flue
12. DP switch — blower proving
13. DP switch — pilot air proving
14. Ignitor
15. Pilot gas valve and pilot gas pressure regulator
16. Flow switch
17. Low water cutoff
18. Pressure/temperature gauge
19. Relief valve
20. High gas pressure switch
21. Low gas pressure switch

XLF
Rear view
Air chamber cover removed

See the Futura XLF Control manual for electrical component locations.



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BEFORE YOU START

This manual covers the application, installation, operation and maintenance of a Futera XLF Series finned copper heating boiler/water heater/pool heater.

To obtain the safe, dependable, efficient operation and long life for which this heating boiler/water heater was designed, these instructions must be read, understood and followed.

The Futera XLF Series finned copper heating boiler/water heaters have been design certified by CSA for use with natural and propane gas under the latest revision of ANSI Z21.10.3/CSA 4.3, Gas Water Heaters, ANSI-Z21.13/CSA 4.9, Gas-Fired Low Pressure Steam and Hot Water Boilers ANSI-Z21.56/CSA 4.7 Gas Fired Pool Heaters and CAN 1-3.1, Industrial and Commercial Gas Fired Packaged Boilers. Each unit has been constructed and hydrostatically tested for a maximum working pressure of 160 psi, 1103 kPa in accordance with Section IV of the ASME Boiler and Pressure Vessel Code.

All aspects of the boiler/water heater installation must conform to the requirements of the authority having jurisdiction, or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1/NFPA 54-latest revision. Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

In Canada, the installation must be in accordance with the requirements of CSA B149.1 or .2, Installation Code for Gas Burning Appliances and Equipment.

If installed in the Commonwealth of Massachusetts, you MUST FOLLOW the additional instructions contained in RBI's instruction sheet, MACODE-3, located in the back of this manual.

The owner should maintain a record of all service work performed with the date and a description of the work done. Include the name of the service organization for future reference.

Direct all questions to your RBI distributor or contact the RBI Customer Service Department at:

U. S. —
260 North Elm Street
Westfield, MA 01085

Canada —
7555 Tranmere Drive
Mississauga ONT L5S 1L4

Always include the model and serial numbers from the rating plate of the boiler/water heater in question.

RATINGS & CAPACITIES

Before undertaking the installation of the Futera XLF Series boiler/water heater check the rating plate to ensure that the unit has been sized properly for the job. The "Net I=B=R Ratings" specify the equivalent amount of direct cast iron radiation that the unit can supply under normal conditions. Also ensure that the unit has been set up for the type of gas available at the installation site. Other important considerations are the availability of an adequate electrical supply, fresh air for combustion and a suitable chimney or vent system.

BOILER/WATER HEATER LOCATION

1. This boiler/water heater is suitable for indoor and outdoor installations. Locate the boiler/water heater in an area that provides good access to the unit. Servicing may require the removal of jacket panels. Allow the minimum clearances between adjacent construction and the boiler/water heater as listed in Table 1.

NOTICE Service clearances are not mandatory, but are recommended to ensure ease of service should it be required.

Table 1 Required clearances

From	Clearance to combustible surfaces		Service clearances	
	Inches	mm	Inches	mm
Top	6	153	30	762
Back	6	153	24	610
Left side	6	153	12	306
Right side	6	153	12	306
Front	6	153	30	762

2. An optimum site will be level, central to the piping system, close to a chimney or outside wall and have adequate fresh air for combustion. Ensure that the boiler/water heater is level from front to back and from side to side. Use metal shims to level the boiler/water heater. Electrical and electronic components must also be protected from exposure to water during operation and maintenance. DO NOT install this boiler/water heater in a location that would subject any of the gas ignition components to direct contact with water or excessive moisture during operation or servicing.
3. Ensure that the floor is structurally sound and will support the weight of the boiler/water heater.

WARNING The Futera XLF may be installed directly on combustible flooring, but never on carpeting.

4. Locate the boiler/water heater in an area that will prevent water damage to adjacent construction should a leak occur or during routine maintenance. If such a location doesn't exist, a suitable drain pan that's adequately drained must be installed under the unit.
5. DO NOT place this boiler/water heater in a location that would restrict the introduction of combustion air into the unit or subject it to a negative pressure, see "GENERAL VENTING GUIDELINES".
6. NEVER place this boiler/water heater in a location that would subject it to temperatures at or near freezing, see the "FREEZE PROTECTION" section on page 14.

WARNING Never store combustible materials, gasoline or any product containing flammable vapors or liquids in the vicinity of the boiler/water heater. Failure to comply with this warning can result in an explosion or fire causing extensive property damage, severe personal injury or death!

COMBUSTION AIR & VENTILATION

WARNING This boiler/water heater must be supplied with combustion air in accordance with Section 5.3, Air for Combustion & Ventilation, of the latest revision of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and all applicable local building codes. Canadian installations must comply with CAN/ CGA B149.1 or .2 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes. Failure to provide adequate combustion air for this boiler/ water heater can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

To operate properly and safely this boiler/water heater requires a continuous supply of air for combustion. NEVER store objects on or around the boiler/water heater!

CAUTION Combustion air contaminated with fluorocarbons or other halogenated compounds such as cleaning solvents and refrigerants will result in the formation of acids in the combustion chamber. These acids will cause premature failure of the boiler/water heater voiding the warranty!

CAUTION If the boiler/water heater is operated while the building is under construction it MUST be protected from wood, concrete, sheet rock and other types of dust. Failure to properly protect the unit from construction dust will damage the unit voiding the warranty!

Buildings will require the installation of a fresh air duct or other means of providing make-up air if the intake air option isn't used. Any building utilizing other gas burning appliances, a fireplace, wood stove or any type of exhaust fan must be checked for adequate combustion air when all of these devices are in operation at one time.

Sizing of an outside air duct must be done to meet the requirements of all such devices.

WARNING Never operate the Futera XLF in an environment subjected to a negative pressure unless it is Direct Vented. Failure to comply with this warning can result in excessive levels of carbon monoxide causing severe personal injury or death!

All air from inside the building

If the Futera XLF is to be located in a confined space, the minimum clearances listed in Table 1, page 4 must be maintained between it and any combustible construction. When installed in a confined space without the intake air option (as in Figure 5, page 10 through Figure 8, page 13) two permanent openings communicating with an additional room(s) are required. The combined volume of these spaces must have sufficient volume to meet the criteria for an unconfined space. The total air requirements of all gas utilization equipment, fireplaces, wood stoves or any type of exhaust fan must be considered when making this determination. Each opening must have a minimum free area of 1 in^2/1000 Btu/hr, 2200 mm^2/kW based on the total input rating of ALL gas utilization equipment in the confined area. Each opening must be no less than 100 in^2, 64,516 mm^2 in size. The upper opening must be within 12 inches, 305 mm of, but not less than 3 inches, 76 mm from, the top of the enclosure. The bottom opening must be within 12 inches, 305 mm of, but not less than 3 inches, 76 mm from, the bottom of the enclosure.

All air from outside the building

When installed in a confined space without utilizing the intake air option two permanent openings communicating directly with, or by ducts to, the outdoors or spaces that freely communicate with the outdoors must be present. The upper opening must be within 12 inches, 305 mm of, but not less than 3 inches, 76 mm from, the top of the enclosure. The bottom opening must be within 12 inches, 305 mm of, but not less than 3 inches, 76 mm from, the bottom of the enclosure.

Where directly communicating with the outdoors or communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in^2/4000 Btu/hr, 550 mm^2/kW of the total input rating of all of the equipment in the enclosure.

Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in^2/2000 Btu/hr, 1100 mm^2/kW of the total input rating of all of the equipment in the enclosure.

When ducts are used, they must have the same cross-sectional area as the free area of the opening to which they connect.

When calculating the free area necessary to meet the make-up air requirements of the enclosure, consideration must be given to the blockage effects of louvers, grills and screens. Screens must have a minimum mesh size of 1/4 inch, 6.4 mm. If the free area through a louver or grill is not known, ducts should be sized per Table 2.

Canadian installations must comply with CSA B149.1 when air supply is provided by natural air flow from the outdoors for natural draft, partial fan-assisted, fan-assisted, or power draft-assisted burners, there shall be a permanent air supply opening(s) having a cross-sectional area of not less than 1 in^2 per 7,000 Btuh (310 mm^2 per kW) up to and including 1 million Btuh, plus 1 in^2 per 14,000 Btuh (155 mm^2 per kW) in excess of 1 million Btuh.

Table 2 Make-up Air Louver Sizing

Input MBH	Required cross-sectional area					
	Wire screen ¼ inch (6.4 mm)		Metal louvers 75% free area		Wooden louvers 25% free area	
	in^2	cm^2	in^2	cm^2	in^2	cm^2
2500	625	4031	833	5382	2500	16127
3000	750	4838	1000	6452	3000	19354
3500	875	5645	1167	7522	3500	22581
4000	1000	6452	1334	8592	4000	25808

Intake air option — General guidelines

This configuration provides combustion air directly to the boiler/water heater's air intake adapter using a dedicated pipe when using the direct vent option. Combustion air can be drawn in horizontally through the same outside wall which terminates the exhaust gases or vertically through the roof, see Figure 1, page 8 through Figure 4, page 9.

WARNING Common intake air systems may be used provided the common duct is sized properly. An intake combustion air damper should be installed if the common vent option is used in the intake air pipe of each heater. Improper installation can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

Table 3 Intake air pipe sizing

Input MBH	Vertical		Horizontal	
	in	mm	in	mm
2500/3000	10	254	8	203
3500/4000	12	305	10	254

All joints in metal intake air systems must be secured using corrosion resistant fasteners and sealed using a suitable Silicone caulk. If PVC or CPVC is used, the joints must be cleaned with a suitable solvent and connected using a solvent based PVC cement.

CAUTION The combustion air system MUST be supported by the building structure not the boiler/water heater.

CAUTION A combustion air damper interlocked with the unit should be installed in the intake air pipe when the infiltration of subfreezing air could occur, otherwise the unit could freeze up voiding the warranty!

Intake air option – Vertical guidelines

The maximum equivalent length for the vertical intake air pipe is 100 ft, 30.5 m. Each 90° elbow and the intake air terminal are equal to 10 linear ft, 3.0 m of pipe, see Table 3.

An approved, nonrestrictive intake air terminal must be used. The intake air terminal must terminate as shown in Figure 3, page 9. The penetration point in the roof must be properly flashed and sealed.

Intake air option – Horizontal guidelines

The maximum equivalent length for the horizontal intake air pipe is 100 ft, 30.5 m. Each 90° elbow and the intake air terminal are equal to 10 linear ft, 3.0 m of pipe. If horizontal runs exceed 5 ft, 1.5 m they must be supported at 3 ft, 0.9 m intervals with overhead hangers. The certified intake air terminal from RBI must be used, see Figure 1, page 8, Figure 2, page 8 and Figure 4, page 9.

GENERAL VENTING GUIDELINES

WARNING The vent installation must be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54– latest revision or applicable provisions of the local building codes. Canadian installations must comply with CAN/CGA B149.1 or .2 Installation Code. Improper venting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

All vent systems must be fully supported by the building structure and not by the boiler/water heater. Appropriate thimbles and fire-stops must be used where required.

WARNING Common vent systems must be properly engineered and sized to provide a negative draft of 0.03 inch, 0.8 mm to 0.1 inch, 2.5 mm W.C. at the flue outlet. Common positive pressure vent systems are not to be used. Improper installation can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

WARNING Common-vent systems — **The boiler closest to the vertical vent must be assigned as the master boiler and always fired FIRST to ensure proper draft and reliable operation**. Consult the factory if any questions. Improper installation can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

EXISTING COMMON VENT SYSTEMS

If an existing boiler/water heater is removed from an existing common venting system, the common venting system may then be too large for the proper venting of the remaining appliances connected to it. At the time of removal of an existing boiler/water heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhaust, so they will operate at maximum speed. Do not operate a summer exhaust fan for a boiler installation. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate Tables in Appendix F in the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 and or CAN/CGA B149 Installation Codes.

VENT SYSTEM OPTIONS

The flue products in the vent system may be cooled below their dew point and form condensate in the flue. The materials used for a Category IV vent must be resistant to any corrosive damage from flue gas condensate. The flue from a Category IV vent system must have a condensate drain with provisions to properly collect and dispose of any condensate that may occur in the venting system.

WARNING Category IV vent/air piping lengths must not exceed 100 equivalent feet. If longer runs are required, use a Category II (negative pressure) vent system, specially engineered/designed to meet all applicable codes.

The Futera XLF may be vented the following ways:

1. **OPTION 1 — Direct Vent, Positive Pressure Category IV (individual venting only) (page 7)**
   Combustion air is piped from the outdoors to the blower inlet. Vent system is certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. Maximum equivalent length of vent and air piping must not exceed 100 feet each.
2. **OPTION 2 — Vertical Vent, Positive Pressure Category IV (individual venting only) (page 10)**
   Combustion air is obtained from the space in which the unit is installed. Vent system is certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. Maximum equivalent length of vent piping must not exceed 100 feet.

3. **OPTION 3 — Side Wall Vent, Positive Pressure Category IV (individual venting only) (page 11)**
Combustion air is obtained from the space in which the unit is installed. Vent system is certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. Maximum equivalent length of vent and air piping must not exceed 100 feet each.

WARNING To ensure proper boiler operation, boilers that use room air must not be fired at less than 33 % input. This applies to OPTION 3 and OPTION 4 venting.

4. **OPTION 4 — Vertical Vent, Negative Pressure Category II (common venting) (page 12)**
Requires negative pressure in vent (natural draft). Requires a metal chimney system approved for Category II venting. This method is required if common venting multiple XLF boilers.

WARNING All venting and combustion air material supplied by installer. All venting materials must be approved for the application. Consult the vent manufacturer's product literature.

Table 4 Category IV venting — vent pipe size (Vent options 1, 2 or 3)

Input MBH	Pipe diameter	
	in	mm
2500/3000	8	203
3500/4000	10	254

OPTION 1: DIRECT VENT POSITIVE PRESSURE — CATEGORY IV HORIZONTAL OR VERTICAL

In this configuration the boiler/water heater blower is used to push the flue products to the outdoors while drawing combustion air from the outdoors. The Intake Air Option instructions under the "Combustion air & ventilation" section must be followed! The vent system must be sized per Table 4.

Horizontal direct vent systems
Figures 1 & 2

The vent materials used in horizontal vent systems must be certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. The certified vent terminal from RBI must also be used.

The maximum equivalent length for the horizontal vent pipe is 100 ft, 30.5 m. Each 90° elbow and the vent terminal are equal to 10 linear ft, 3.0 m of pipe. If any part of a single wall metal vent system passes through an unheated space, it must be insulated with insulation rated for 400°F, 204°C. Structural penetrations must be made using approved fire-stops. For best results, horizontal vent systems should be as short and straight as possible.

The vent system must be both gas tight and water-tight. All seams and joints in metal pipes must be joined and sealed in accordance with the vent system manufacturer's instructions.

When horizontal vent runs exceed 5 ft, 1.5 m they must be supported at 3 ft, 0.9 m intervals with overhead hangers. The vent system must be pitched down, toward the vent terminal, 1/4 in/ft, 20 mm/m. If any part of a single wall metal vent system passes through an unheated space it must be insulated with insulation rated for 400°F, 204°C.

Horizontal vent systems shall terminate at least 4 ft, 1.2 m below, 4 ft, 1.2 m horizontally from or 1 ft, 0.30 m above any door, window or gravity air inlet into any building.

It must not terminate less than 4 ft, 1.2 m horizontally from, and in no case above or below, unless a 4 ft, 1.2 m horizontal distance is maintained, from electric meters, gas meters, regulators and relief equipment; and not less than 7 ft, 2.1 m above adjacent public walkway.

NOTICE Canadian installations require a minimum of 6 ft, 18.3 m clearance from electric meters, gas meters, regulators and relief equipment for compliance with CAN B149.1.

The bottom of the vent terminal(s) shall be located at least 5 ft, 1.5 m above the air intake terminal(s) unless there is a minimum 5 ft, 1.5 m horizontal separation between them.

Avoid terminal locations likely to be affected by winds, snowdrifts, people and pets. Protect building materials and vegetation from degradation caused by the flue gases.

Vertical direct vent systems
Figure 3 (vent/air pipe equivalent lengths up to100 feet maximum)

If any part of a single wall metal vent system passes through an unheated space, it must be insulated with insulation rated for 400°F, 204°C. Structural penetrations must be made using approved fire-stops.

An approved, nonrestrictive vent terminal must be used. The top of a vertical vent system must extend at least 5.5 ft, 1.7 m above the roof surface and maximum snow line that it passes through, 4 ft, 1.2 m above the intake air terminal, see Figure 3.

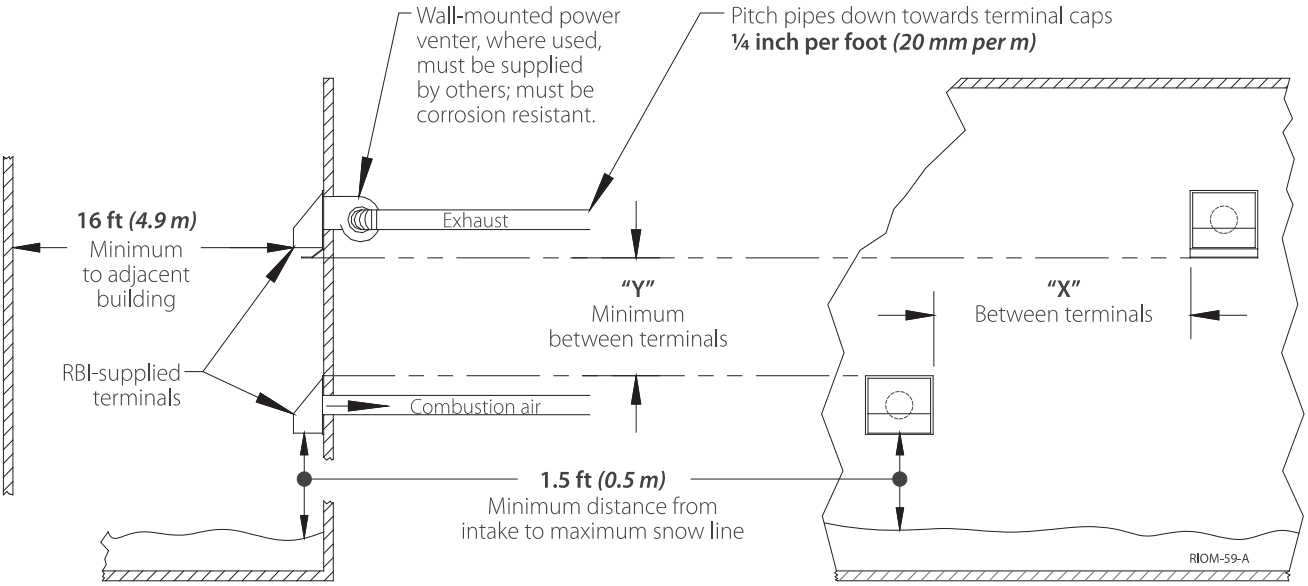
In addition the vent system must conform to the dimensions shown in Figure 3, page 9. The penetration point in the roof must be properly flashed and sealed.

The vent system must be gas tight. All seams and joints in metal pipes must be joined and sealed in accordance with the vent system manufacturer's instructions.

Combination direct vent systems
Figure 4 (vent/air pipe equivalent lengths up to100 feet maximum)

The boiler/water heater can be vented vertically with the intake air piped horizontally through an outside wall. Follow the instructions in the Intake Air Option — Horizontal Guidelines on page 6. Also follow the general instructions in the "Combustion Air & Ventilation" and "General Venting Guidelines" sections.

Figure 1 VENT OPTION 1: DIRECT VENT — Horizontal air intake and venting for a single direct vent system
Vent pipe and air pipe equivalent lengths must not exceed 100 feet each. See Table 3 or 4 for min. pipe diameters.


Wall-mounted power venter, where used, must be supplied by others; must be corrosion resistant.
Pitch pipes down towards terminal caps
¼ inch per foot (20 mm per m)
16 ft (4.9 m) Minimum to adjacent building
Exhaust
"Y" Minimum between terminals
"X" Between terminals
RBI-supplied terminals
Combustion air
1.5 ft (0.5 m) Minimum distance from intake to maximum snow line
RIOM-59-A

WARNING When running horizontal combustion air and venting for single or multiple units, exhaust and combustion air terminals must be installed on the same plane (outside wall) in order to prevent pressure differences due to prevailing winds. In cold climates, double-wall or insulated inlet pipe is recommended to prevent condensation.

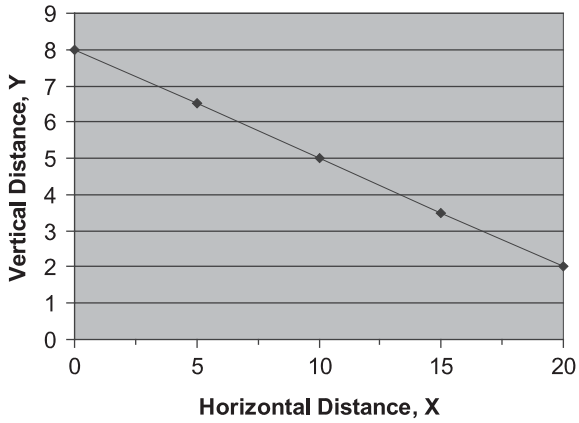


Figure 2 VENT OPTION 1: DIRECT VENT — Horizontal air intake and venting for multiple direct vent systems
Vent pipe and air pipe equivalent lengths must not exceed 100 feet each. See Table 3 or 4 for min. pipe diameters.

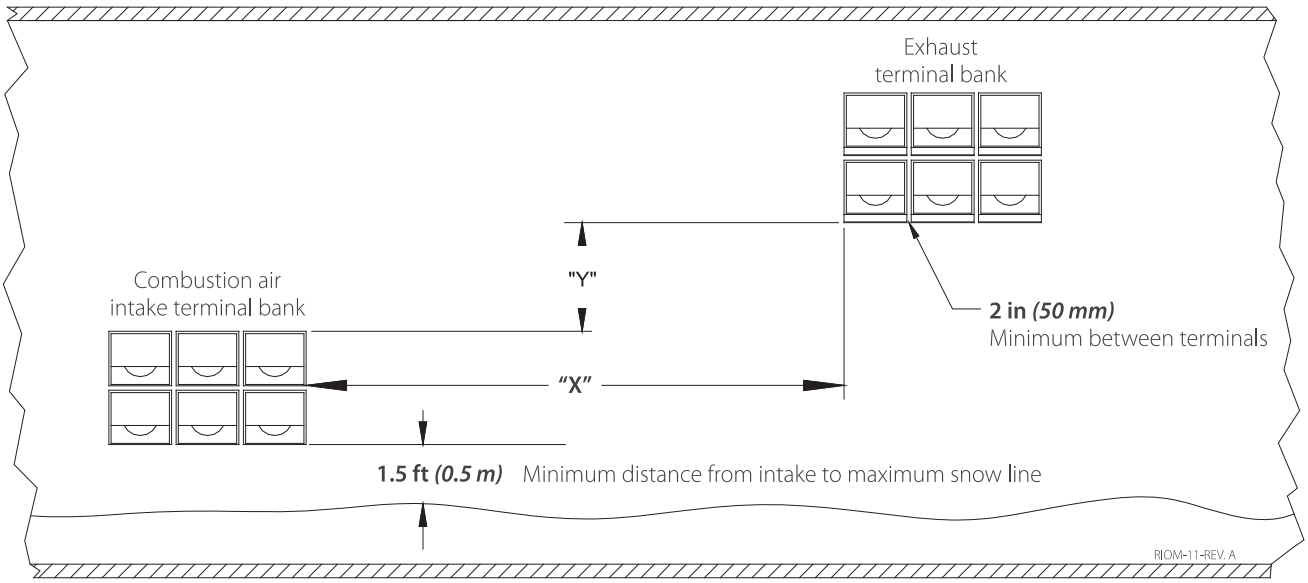
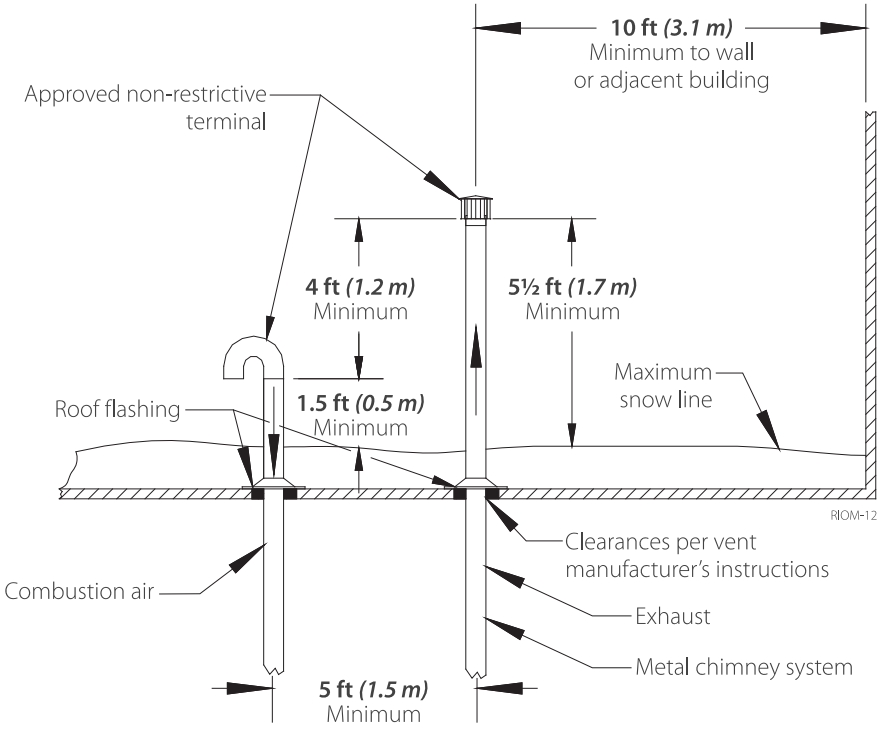

Exhaust terminal bank
Combustion air intake terminal bank
"Y"
"X"
2 in (50 mm) Minimum between terminals
1.5 ft (0.5 m) Minimum distance from intake to maximum snow line
RIOM-11-REV. A

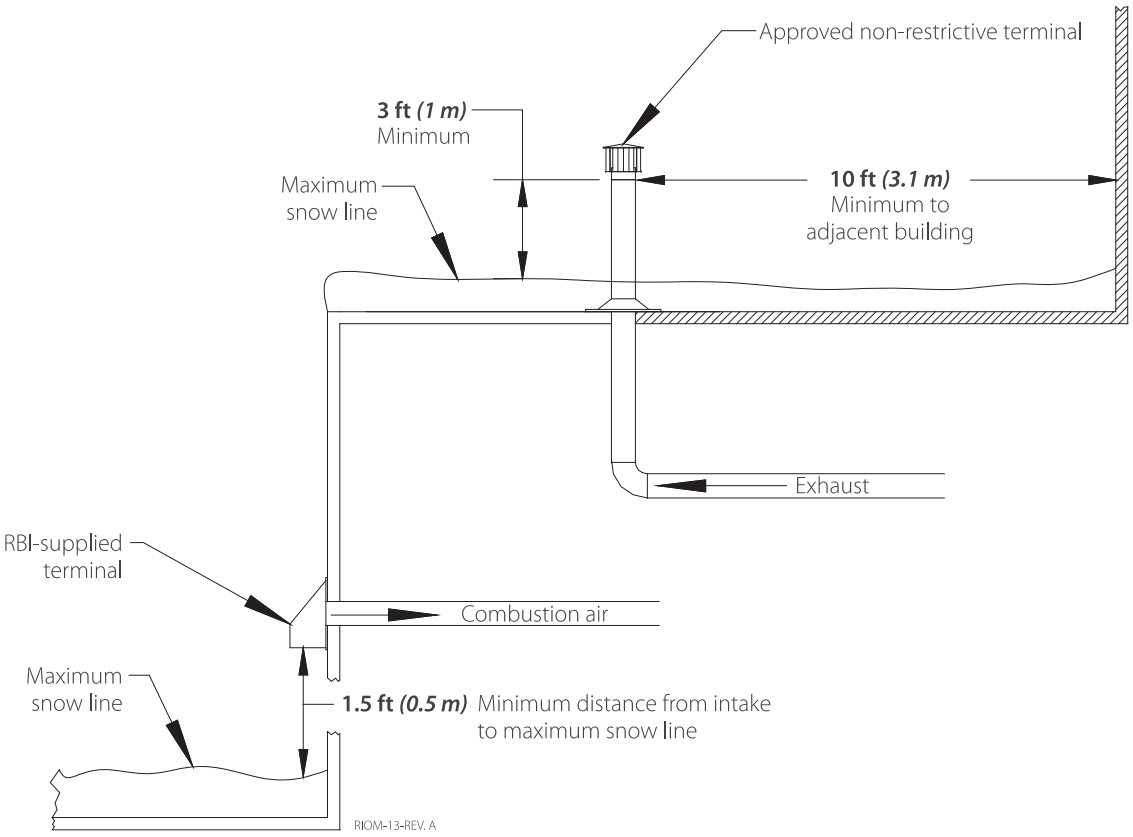
Figure 4 VENT OPTION 1: DIRECT VENT — Vertical air intake and venting for direct vent system
Vent pipe and air pipe equivalent lengths must not exceed 100 feet each. See Table 3 or 4 for min. pipe diameters.



WARNING

Locate exhaust terminal downwind from air intake to reduce potential for flue gas recirculation. Failure to comply could result in severe personal injury or death.

Figure 3 VENT OPTION 1: DIRECT VENT — Combination direct vent system
Vent pipe and air pipe equivalent lengths must not exceed 100 feet each. See Table 3 or 4 for min. pipe diameters.



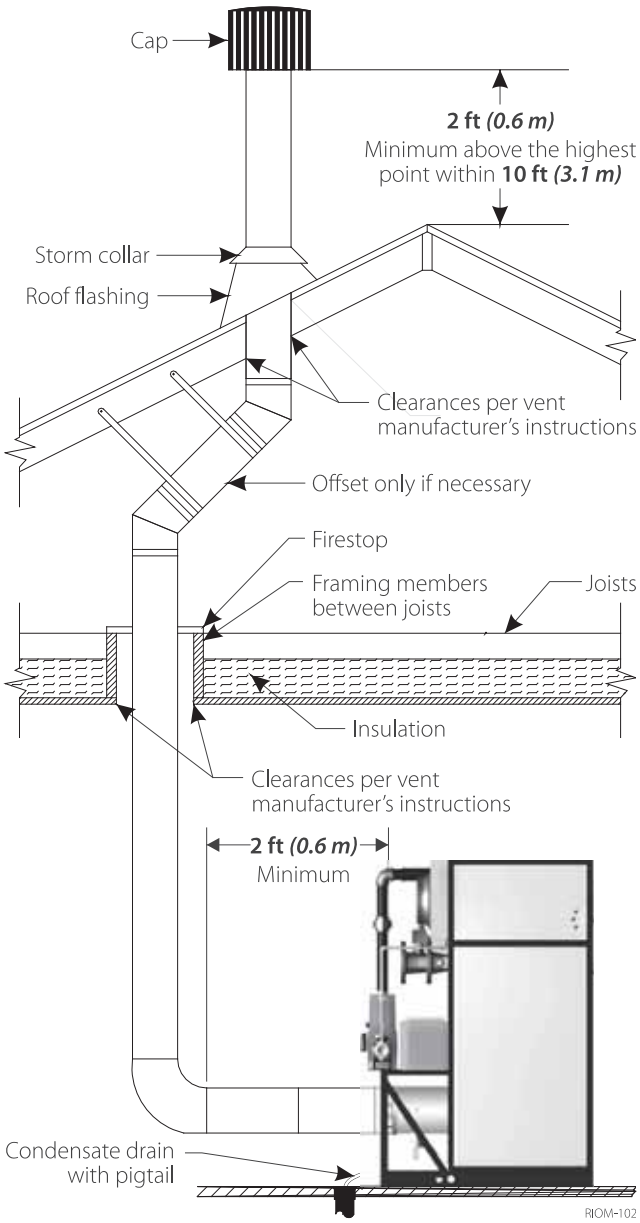
OPTION 2: VERTICAL VENTING POSITIVE PRESSURE, CATEGORY IV
FIGURE 5 OR FIGURE 6

(VENT PIPE EQUIVALENT LENGTH UP TO 100 FEET MAXIMUM)

WARNING Masonry chimneys, when used, must be lined with a metal liner certified for Category IV venting.

A thorough inspection of the masonry chimney must be performed to ensure that the chimney is clean, properly constructed, lined and sized. Exterior masonry chimneys should not be used unless properly lined to prevent condensation and draft problems. Table 4 lists the equivalent breeching and flue sizes required for the boiler/water heater.

Figure 5 VENT OPTION 2: VERTICAL CHIMNEY VENTING
Vertical venting — with a metal chimney system
See Figure 4, page 7 for minimum pipe diameters.



Vent connections

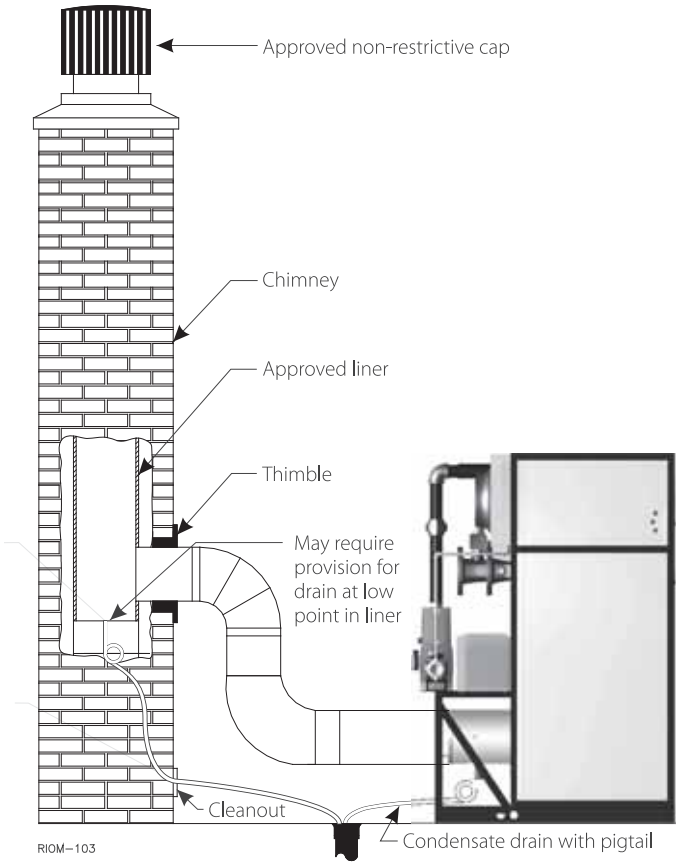
Locate the boiler/water heater as close to the chimney as possible. Use the shortest, straightest vent connector possible for the installation. If horizontal runs exceed 5 ft, 1.5 m they must be supported at 3 ft, 0.9 m intervals with overhead hangers.

The vent connector should be sloped up toward the chimney at a minimum rate of ¼ in/ft, 21 mm/m. On masonry chimneys the connector must terminate flush with the inside of the chimney flue, Figure 8, page 13.

Always provide a minimum clearance of 6 inches, 152 mm between single wall vent pipe and any combustible materials.

WARNING Failure to maintain minimum clearances between vent connectors and any combustible material can result in a fire causing extensive property damage, severe personal injury or death!

Figure 6 VENT OPTION 2: VERTICAL CHIMNEY VENTING
Vertical venting — using a lined masonry chimney
See Figure 4, page 7 for minimum pipe diameters.



OPTION 3: SIDE WALL VENTING POSITIVE PRESSURE —CATEGORY IV

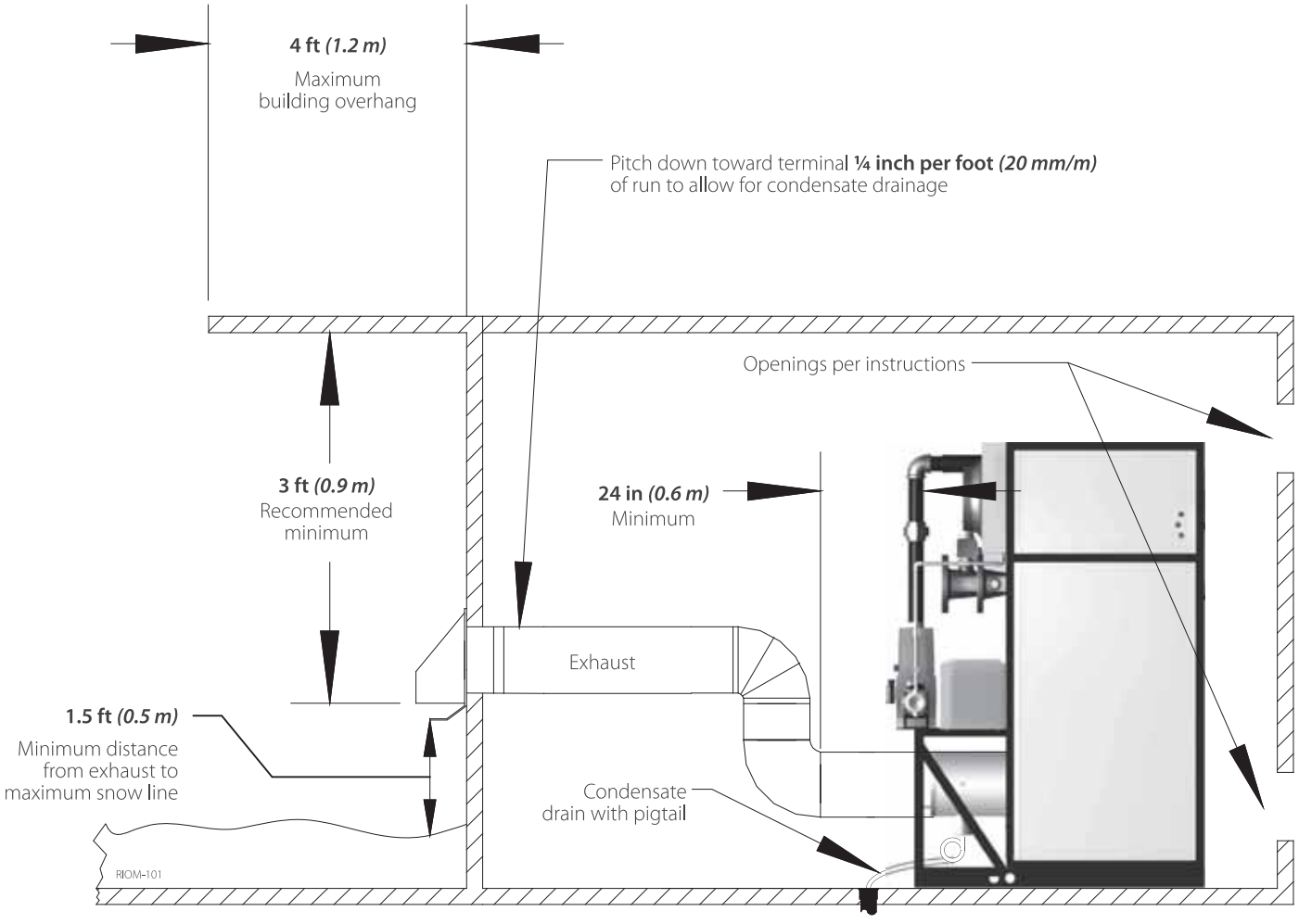
FIGURE 7

(VENT/AIR PIPE EQUIVALENT LENGTHS UP TO 100 FEET MAXIMUM)

In this configuration the boiler/water heater blower is used to push the flue products horizontally to the outdoors, see Figure 7. The air for combustion is taken from the space in which the unit is installed. The applicable instructions under the "Combustion Air & Ventilation" section must be followed! The vent guidelines under the Horizontal Direct Vent Systems section must also be followed.

WARNING To ensure proper boiler operation, boilers that use room air must not be fired at less than 33% input.

Figure 7 VENT OPTION 3: SIDE WALL VENT — Side wall venting
Vent pipe and air pipe equivalent lengths must not exceed 100 feet each.


4 ft (1.2 m)
Maximum building overhang
Pitch down toward terminal ¼ inch per foot (20 mm/m) of run to allow for condensate drainage
Openings per instructions
3 ft (0.9 m)
Recommended minimum
24 in (0.6 m)
Minimum
Exhaust
1.5 ft (0.5 m)
Minimum distance from exhaust to maximum snow line
Condensate drain with pigtail
RIOM-101

OPTION 4: VERTICAL CHIMNEY VENTING NEGATIVE PRESSURE — CATEGORY II (*MULTIPLE BOILERS WITH COMMON VENTING*) FIGURE 8

WARNING Category II venting is required for multiple XLF boilers connected to a common vent. Common vent systems cannot be pressurized.

The Futera XLF is listed as a Category II appliance when vented vertically into a listed metal chimney system. See Figure 8, page 13 (multiple boilers). The chimney must provide a negative pressure not greater than 0.15 inch, 3.8 mm w.c. at the boiler/water heater flue collar with the unit running.

NOTICE When using a listed metal chimney system the chimney system manufacturer's instructions must be followed.

WARNING The vent piping must be large enough to safely vent the combined output of all of the appliances connected to the system.

If an appliance using any type of a mechanical draft system operating under positive pressure is connected to a chimney flue, never connect any other appliances to this flue. Doing so can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

WARNING To ensure proper boiler operation, boilers that use room air must not be fired at less than 33% input.

CATEGORY II CHIMNEY INSPECTION & SIZING

WARNING Masonry chimneys, when used, must be lined with a metal liner certified for Category IV venting.

A thorough inspection of the masonry chimney must be performed to ensure that the chimney is clean, properly constructed, lined and sized. Exterior masonry chimneys should not be used unless properly lined to prevent draft problems.

Table 5 lists the minimum riser sizes required for the XLF boiler/water heater.

Table 5 Riser diameters to common vent for Category II venting

Input — MBH	in	mm
2500/3000	12	305
3500/4000	14	356
Note: These sizes are based on a 20 ft, 6.1m chimney height.		

CATEGORY II VENT CONNECTIONS

Locate the boiler/water heater as close to the chimney as possible. Use the shortest, straightest vent connector possible for the installation. If horizontal runs exceed 5 ft, 1.5 m they must be supported at 3 ft, 0.9 m intervals with overhead hangers.

The boiler vent connectors should be sloped up toward the breeching at a minimum rate of ¼ in per ft, 21 mm per m. On masonry chimneys the connector must terminate flush with the inside of the chimney liner (as shown in Figure 6, page 10).

Always provide a minimum clearance of 6 inches, 152 mm between single wall vent pipe and any combustible materials.

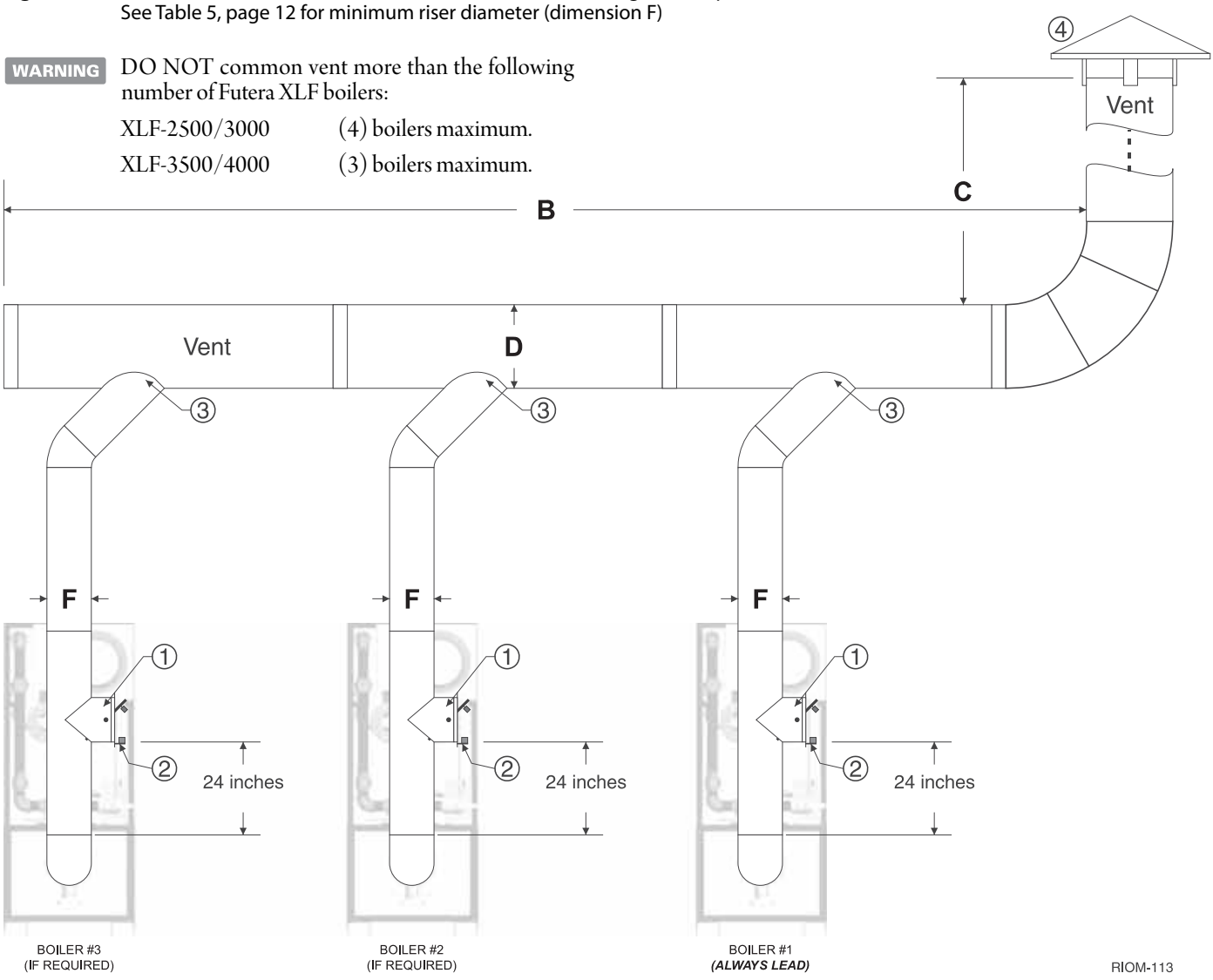
WARNING Failure to maintain minimum clearances between vent connectors and any combustible material can result in a fire causing extensive property damage, severe personal injury or death!

Figure 8 OPTION 4: VERTICAL CHIMNEY VENTING — Vertical venting — multiple-boiler installations
See Table 5, page 12 for minimum riser diameter (dimension F)

WARNING DO NOT common vent more than the following number of Futera XLF boilers:

XLF-2500/3000 (4) boilers maximum.

XLF-3500/4000 (3) boilers maximum.



Legend for Figure 8

WARNING The boiler nearest the vertical chimney must always be fired first.

A negative pressure of 0.02 to 0.08 inches w.c. is required in each boiler's riser when all boilers are operating at full input.

Provide clearance from the boiler of no less than 6 inches to combustible surfaces or 24 inches for service.

1. A barometric damper must be installed on the riser of each boiler, 24 inches above the vent elbow. [Exception: If the vent system is designed using accepted engineering practices, and the design calculations prove there is no need for barometric dampers, the barometric dampers may be omitted.] When required by applicable codes, install a thermal spill switch on each barometric damper.
2. Install a thermal spill switch on each barometric damper (when required by applicable codes).
3. Connect each boiler riser to the common vent with a y connection only.
4. Install an approved vent cap at the vent termination.
5. DIMENSIONS:
   - B breeching length
   - C chimney height
   - D breeching diameter
   - F riser diameter (no smaller than the dimension given in Table 5, page 12)
6. Size the chimney and breeching per local codes and vent pipe manufacturer's recommendations, using generally accepted engineering practices.

GENERAL PIPING REQUIREMENTS

CAUTION Improper piping of this boiler/water heater will void the manufacturer's warranty and can cause boiler failure resulting in flooding and extensive property damage! Excessive water hardness causing scaling in the copper heat exchanger tubes is NOT covered under the manufacturer's warranty. See Table 8, page 20. Excessive pitting and erosion of the internal surface of the copper heat exchanger tubes is NOT covered under the manufacturer's warranty if the result of high water flow rates. See Table 7, page 16. Return water temperatures below 140°F, 60°C will result in heat exchanger damage from excessive condensation voiding the manufacturer's warranty, see Primary/Secondary Piping. See Figure 9, page 15.

NOTICE Shut off valves and unions should be installed at the inlet and outlet connections of the boiler/hot water heater to provide for isolation of the unit should servicing be necessary.

Freeze protection

Installations in areas where the danger of freezing exists are not recommended unless proper freeze protection is provided. The following precautions MUST be observed:

1. A continuous flow of water through the unit MUST be maintained! The pump responsible for flow through the boiler/water heater must run continuously!
2. An ethylene glycol/water mixture suitable for the minimum temperature that the unit will be exposed to must be used. The pump must be capable of producing a minimum of 15% more flow and overcoming a 20% increase in head loss. Domestic water systems must be isolated from the water heater by the use of a heat exchanger or other approved method.
3. If the unit must be shut off for any reason the electric, gas and water supplies MUST be shut off and the unit and its pump completely drained.

CAUTION Improper outdoor installation of this unit can cause boiler failure voiding the manufacturer's warranty!

Relief valve

Pipe the discharge of the pressure relief valve as shown in Figure 9, page 15.

WARNING Never install any type of valve between the boiler/water heater and the relief valve or an explosion causing extensive property damage, severe personal injury or death may occur!

Flow Switch

The flow switch supplied with the boiler/water heater must be wired to the terminal strip in the control panel to prevent the boiler from firing unless there's adequate water flow through the unit. The flow switch must be installed in the supply piping adjacent to the boiler outlet connection.

CAUTION Failure to properly install the flow switch may result in damage to the boiler/water heater heat exchanger voiding the warranty!

HEATING SYSTEM PIPING

General piping requirements

All heating system piping must be installed by a qualified technician in accordance with the latest revision of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV, and ANSI/ASME CSD-1, Standard for Controls and Safety Devices for Automatically Fired Boilers. All applicable local codes and ordinances must also be followed. A minimum clearance of 1 inch, 25 mm must be maintained between heating system pipes and all combustible construction. All heating system piping must be supported by suitable hangers not the boiler. The thermal expansion of the system must be considered when supporting the system. A minimum system pressure of 12 psig, 82.7 kPa must be maintained.

Heating boiler piping connections

The supply and return connections should be sized to suit the system, per Table 6.

Table 6 Supply & Return Pipe Sizing

Input MBH	Supply size	Return size
2500/3000	4" FLANGE	4" FLANGE
3500/4000	4" FLANGE	4" FLANGE

Pump requirements

This low mass boiler requires a continuous minimum water flow for proper operation. The boiler pump must be sized to overcome the head loss of the boiler and the near-boiler piping in order to achieve the required temperature rise. Table 7 provides the heat exchanger pressure drop and temperature rise figures. The temperature rise across the boiler must never exceed 35°F, 19.4°C. The adjustable pump delay turns the pump on each time the burner fires and runs the pump for 20 to 600 seconds after the call for heat is satisfied.

WARNING A temperature rise outside of the range listed in Table 7 will result in damage to the heat exchanger, voiding the warranty! The maximum allowable temperature rise through the boiler is 35°F, 19.4°C.

WARNING The maximum allowable flow rate through a Futera XLF boiler is 260 GPM, 16.4 L/s when equipped with copper tubes. A cupronickel heat exchanger allows for 315 GPM, 19.9 L/s.

Figure 9 Futera XLF Piping

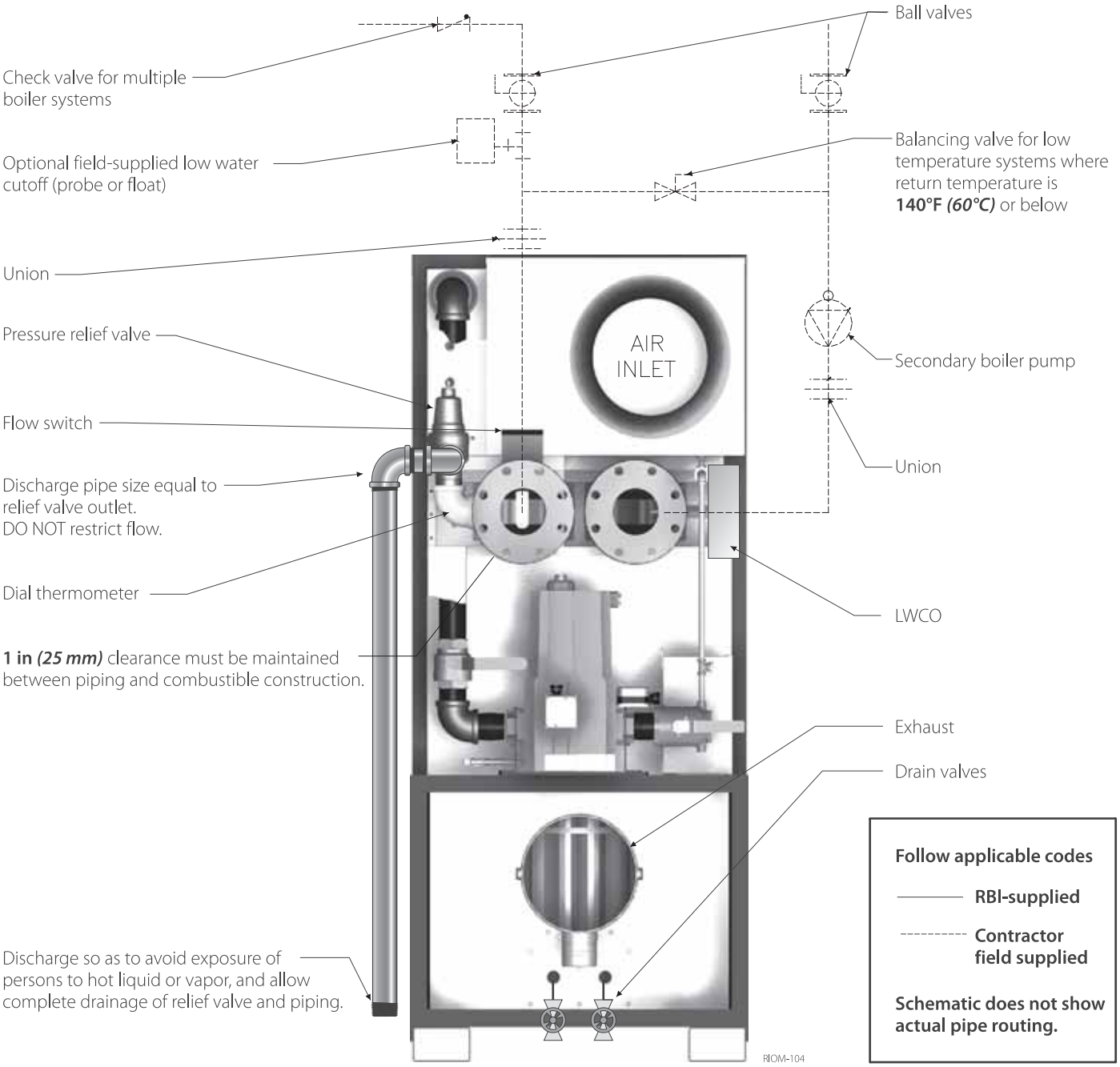

Ball valves
Check valve for multiple boiler systems
Optional field-supplied low water cutoff (probe or float)
Balancing valve for low temperature systems where return temperature is **140°F** ***(60°C)*** or below
Union
Pressure relief valve
Flow switch
Discharge pipe size equal to relief valve outlet. DO NOT restrict flow.
Dial thermometer
1 in ***(25 mm)*** clearance must be maintained between piping and combustible construction.
AIR INLET
Secondary boiler pump
Union
LWCO
Exhaust
Drain valves
Discharge so as to avoid exposure of persons to hot liquid or vapor, and allow complete drainage of relief valve and piping.
RIOM-104
Follow applicable codes
RBI-supplied
Contractor field supplied
Schematic does not show actual pipe routing.

Table 7 Temperature Rise Table

Model Number	ΔT = 20°F		ΔT = 11.1°C	
	Flow Rate	Pres. Drop	Flow Rate	Pres. Drop
	GPM	Ft	L/s	kPa
2500	217.5	10.05	13.7	29.6
3000	261.0	15.20	16.5	44.8
3500	304.5*	20.26	19.2*	59.7
4000	NA	NA	NA	NA
Model Number	ΔT = 25°F		ΔT = 13.9°C	
	Flow Rate	Pres. Drop	Flow Rate	Pres. Drop
	GPM	Ft	L/s	kPa
2500	174.0	6.45	11.0	19.0
3000	208.8	9.73	13.2	28.7
3500	243.6	13.40	15.4	39.5
4000	278.4 *	17.30	17.6*	51.0
Model Number	ΔT = 30°F		ΔT = 16.7°C	
	Flow Rate	Pres. Drop	Flow Rate	Pres. Drop
	GPM	Ft	L/s	kPa
2500	145.0	3.71	9.1	10.9
3000	174.0	6.75	11.0	19.9
3500	203.0	9.56	12.8	28.2
4000	232.0	12.00	14.6	35.4
Model Number	ΔT = 35°F		ΔT = 19.4°C	
	Flow Rate	Pres. Drop	Flow Rate	Pres. Drop
	GPM	Ft	L/s	kPa
2500	124.3	2.79	7.8	8.2
3000	149.1	4.65	9.4	13.7
3500	174.0	7.19	10.9	21.2
4000	198.9	10.48	12.5	30.9

* This flow rate exceeds the recommended maximum for a boiler with a standard copper heat exchanger. Use a greater temperature rise or consult manufacturer. Consider a cupro-nickel heat exchanger, because its maximum flow rate is 315 GPM.

Low water cutoff

If a boiler is installed above any radiation elements it must be fitted with a low water cutoff device.

Refer to the wiring diagram supplied with the boiler/water heater for proper wiring connections.

Expansion tank and air separator

An expansion tank or other means to control thermal expansion must be installed in the heating system. An expansion tank must be installed close to the boiler on the suction side of the pump. An air scoop and automatic air vent must also be installed to eliminate air trapped in the system.

Primary/secondary piping

Boilers connected to heating systems using zone valves, zone pumps, or systems that have excessive flow rates or return water temperatures less than 140°F, 60°C must be isolated from these systems to protect the boiler.

Variable water flows

Figure 10, shows a typical primary/secondary piping system. A dedicated pump is used to maintain a constant water flow through the boiler. This boiler pump is sized to overcome the head loss of the boiler and near-boiler piping system while supplying the flow rate required to maintain the desired temperature rise across the boiler heat exchanger. The system pump is sized to provide the required flow to the heating system. The boiler piping connections to the heating system piping must be a maximum 6 pipe diameters between centers to ensure zero pressure drop in the primary system.

Low return water temperatures

To prevent the problems associated with condensation of the products of combustion due to low return water temperatures a primary/secondary piping system with a bypass and bypass valve must be installed, see Figures 11 and 12. The bypass system must be sized the same as the secondary piping. The primary and secondary pumps should be sized to provide the required flow through each system. The boiler piping connections to the heating system piping must be a maximum 6 pipe diameters between centers to ensure zero pressure drop in the primary system.

Multiple boiler systems

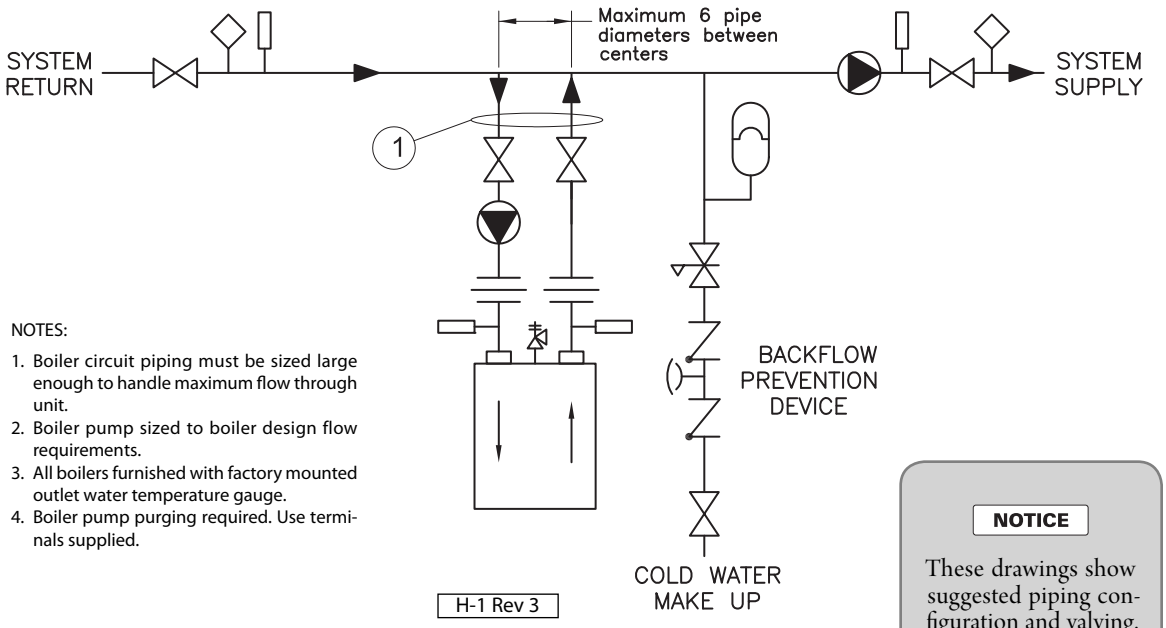
Systems using multiple boilers can also be installed using a primary/secondary manifold system, Figure 13.

Piping for use with cooling units

The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler. Appropriate valves must be used to prevent the chilled water from entering the boiler.

When a boiler is connected to a heating coil that may be exposed to refrigerated air from an air handling device, the piping system must be equipped with flow-control valves or some other automatic means of preventing gravity circulation of the boiler water during the cooling cycle.

Figure 10 Typical Primary/Secondary Piping System *(See Notes)*



NOTES:

1. Boiler circuit piping must be sized large enough to handle maximum flow through unit.
2. Boiler pump sized to boiler design flow requirements.
3. All boilers furnished with factory mounted outlet water temperature gauge.
4. Boiler pump purging required. Use terminals supplied.

NOTICE

These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

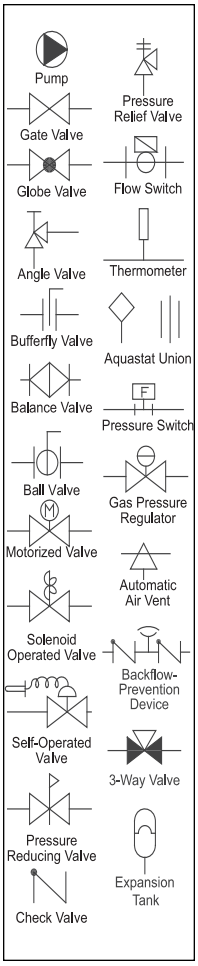
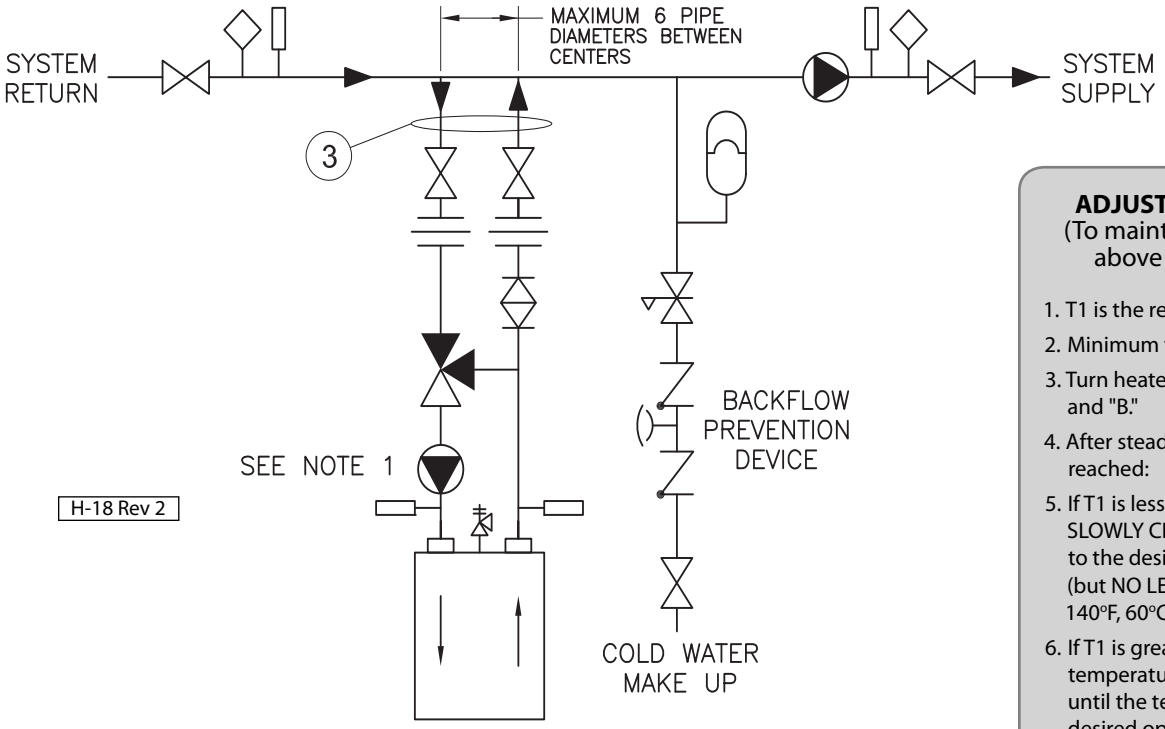


Figure 11 Low Temperature Piping with Thermostatic Valve
(See Notes and Adjustment Procedure)



NOTES:

1. For pump selection consult factory.
2. Boiler pump sized to boiler and thermostatic 3-way valve design flow requirements.
3. Boiler circuit piping must be sized large enough to handle maximum flow through unit.
4. All boilers furnished with factory mounted outlet water temperature gauge.
5. Boiler pump purging required. Use terminals supplied.
6. Valve is pre-calibrated for 140°F return temperature.

ADJUSTMENT PROCEDURE
(To maintain inlet temperature above flue gas dewpoint)

1. T1 is the return water temperature.
2. Minimum temp, T1 = 140°F, 60°C.
3. Turn heater on and OPEN valves "A" and "B."
4. After steady-state operation is reached:
5. If T1 is less than 140°F, 60°C: SLOWLY CLOSE valve "B" until T1 rises to the desired operating temperature (but NO LESS than the minimum, 140°F, 60°C).
6. If T1 is greater than desired operating temperature, slowly close valve "A" until the temperature drops to the desired operating temperature (but NO LESS than the minimum, 140°F, 60°C).
7. Check again after system operating temperature has stabilized. Then make final adjustments.

Figure 12 Low Temperature Piping (See Notes and Adjustment Procedures)

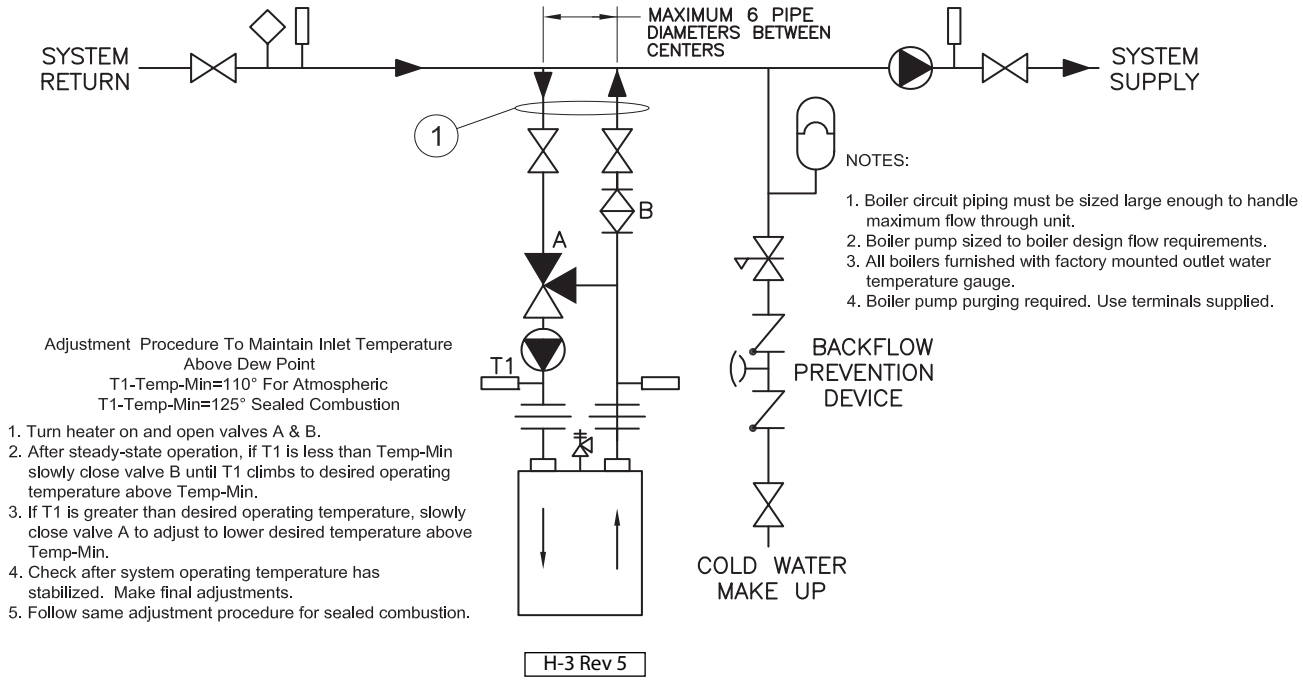
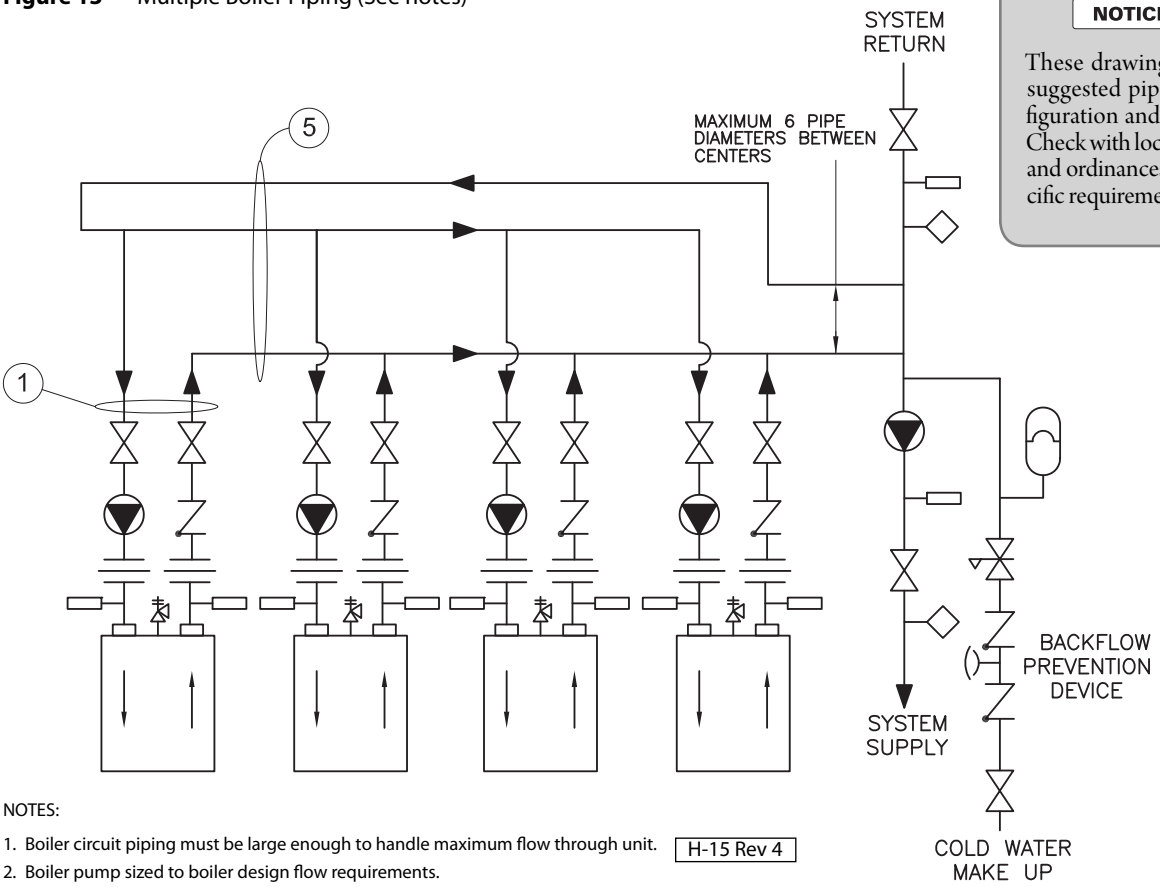

SYSTEM RETURN
MAXIMUM 6 PIPE DIAMETERS BETWEEN CENTERS
SYSTEM SUPPLY
1
B
A
T1
BACKFLOW PREVENTION DEVICE
COLD WATER MAKE UP
NOTES:
1. Boiler circuit piping must be sized large enough to handle maximum flow through unit.
2. Boiler pump sized to boiler design flow requirements.
3. All boilers furnished with factory mounted outlet water temperature gauge.
4. Boiler pump purging required. Use terminals supplied.
Adjustment Procedure To Maintain Inlet Temperature Above Dew Point
T1-Temp-Min=110° For Atmospheric
T1-Temp-Min=125° Sealed Combustion
1. Turn heater on and open valves A & B.
2. After steady-state operation, if T1 is less than Temp-Min slowly close valve B until T1 climbs to desired operating temperature above Temp-Min.
3. If T1 is greater than desired operating temperature, slowly close valve A to adjust to lower desired temperature above Temp-Min.
4. Check after system operating temperature has stabilized. Make final adjustments.
5. Follow same adjustment procedure for sealed combustion.
H-3 Rev 5

Figure 13 Multiple Boiler Piping (See notes)



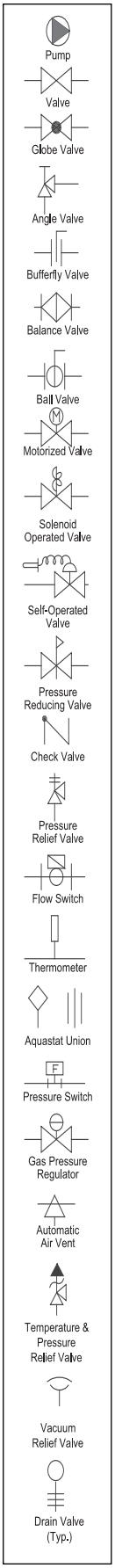
NOTICE

These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

NOTES:

1. Boiler circuit piping must be large enough to handle maximum flow through unit.
2. Boiler pump sized to boiler design flow requirements.
3. All boilers furnished with factory mounted outlet water temperature gauge.
4. Boiler pump purging required. Use terminals supplied.
5. Secondary loop pipe diameter must be sized large enough to handle maximum flow through all units.

H-15 Rev 4



DOMESTIC WATER SUPPLY PIPING

CAUTION Proper controls must be used to prevent water supplied for domestic use from exceeding 130°F, 54°C or a scald injury will occur! When higher water temperatures are required for appliances such as a dishwasher, a mixing valve or some other tempering means must be installed. Households with small children may require water temperatures less than 120°F, 49°C. Local codes must be complied with!

General piping requirements

Ensure that the water heater is equipped with bronze headers. Piping and components connected to the water heater must be suitable for use with potable water. The water heater must not be connected to any heating system piping or components previously used with a non-potable water heating appliance. No toxic chemicals, such as those used for boiler treatment, are to be introduced into the potable water used for space heating. If a hot water storage tank is used in the system it must be equipped with a temperature and pressure relief valve that complies with ANSI Z21.22 or CAN-4.4 and CAN-4.6.

NOTICE The storage tank must be located as close to the water heater as possible to prevent excessive head loss which will reduce flow.

Water chemistry

The required temperature rise across the water heater is based on water having a hardness between 8 and 18 grains per gallon with a level of dissolved solids not exceeding 350 ppm. Water having a hardness less than 8 grains can cause excessive corrosion of the heat exchanger. Water that has a hardness greater than 18 grains per gallon and/or a level of dissolved solids exceeding 350 ppm will require a recalculation of the pump size and temperature rise.

A cupronickel heat exchanger may also be required. The manufacturer should be consulted when these water conditions are encountered. See Table 8, page 20.

CAUTION The maximum allowable flow rate through a Futera XLF water heater is 260 GPM, 16.4 L when equipped with copper tubes. The cupronickel heat exchanger allows for 315 GPM, 19.9 L/s. See Table 9, page 20.

RBI water heaters are designed to run scale free. Due to the extreme variables of water conditions world wide it is necessary to consider pH values and water hardness in relationship to scaling. It is crucial to consider these two variables when making heat exchanger and pump selections. If local water conditions are extreme, follow the guidelines in the Heat Exchanger

TEMPERATURE RISE CONTROL

WARNING Water returned to the water heater inlet must not be less than 140°F, 60°C or excessive condensation of the products of combustion will damage the water heater, voiding the warranty. The method outlined below can be employed to prevent this condition from occurring.

A balancing valve should be installed on the outlet side of the water heater for purposes of adjusting the flow rate through the heat exchanger. Thermometers are installed on both the inlet and outlet of the water heater for determining the temperature rise through the unit.

The proper velocity through the water heater must be maintained in accordance with Table 9, page 20 for efficient operation and long life. If the temperature rise through the water heater is lower than recommended the water velocity is too high. Premature erosion of the heat exchanger will occur. Conversely, if the temperature rise is higher than recommended in Table 9, page 20 the flow rate is too low. Scaling and softening of the heat exchanger will occur.

Thermostatic Mixing Valve – Water Above 140°F, 60°C Water can be stored at temperatures above 140°F, 60°C provided that a thermostatically controlled mixing valve is used to temper the hot water to an acceptable temperature before it's supplied for domestic use.

The mixing valve MUST be set to prevent a scald injury from occurring, see the caution against scalding.

Storage of water for domestic use above 140°F, 60°C will provide an increased quantity of tempered water and help prevent the growth of water born bacteria.

Selection Table (Table 8) and the Pumping Performance Table (Table 9). Scale free operation can be achieved by using water with a hardness between 8 and 18 and by maintaining the pH between 5 and 9. Follow the conditions listed under NORMAL in the table. In some areas of the country additional precautions must be observed due to unusual characteristics of the local water supply. Call the nearest RBI representative for details.

To properly size the pump a grain hardness and pH test must be taken at the installation site before the order is placed. Proper pump sizing will improve heater performance and help ensure heater longevity.

Expansion Tank

An expansion tank or other means to control thermal expansion must be installed in the water heating system if back flow prevention devices are installed.

Pump Requirements

This low-mass water heater requires a continuous minimum water flow for proper operation. The low water flow switch provided for this unit will shut down the water heater if flow falls below the required minimum level. Table 9 provides the heat exchanger pressure drop chart and temperature rise table. The temperature rise across the water heater must never exceed 35°F, 19.4°C.

Cold Water Supply

The cold water supply must be piped to the water heater's outlet piping between the water heater and the hot water storage tank. This will prevent untempered water from entering the water heater. See the Temperature Rise Control section, page 19.

Two typical water heating systems are shown in Figures 14 and 15.

Table 8 Futera XLF Heat Exchanger Selection

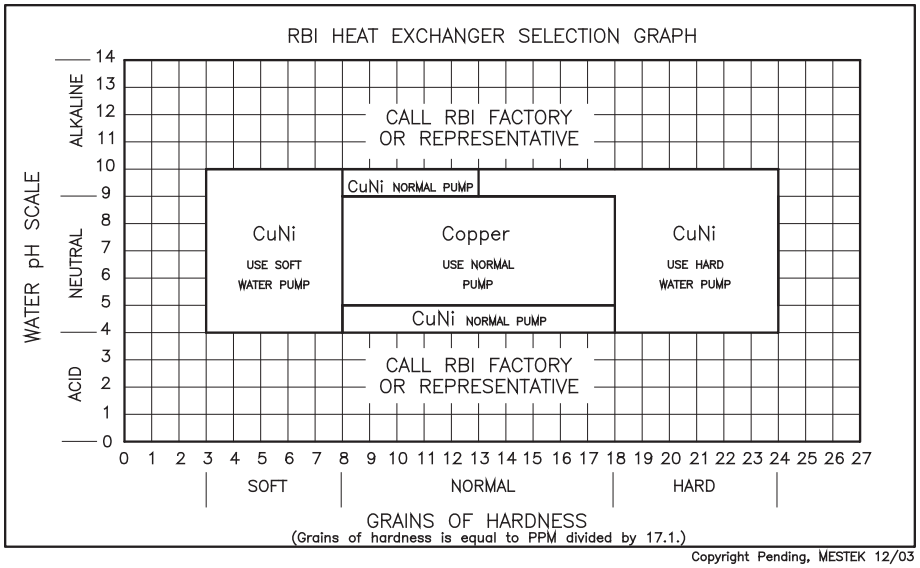
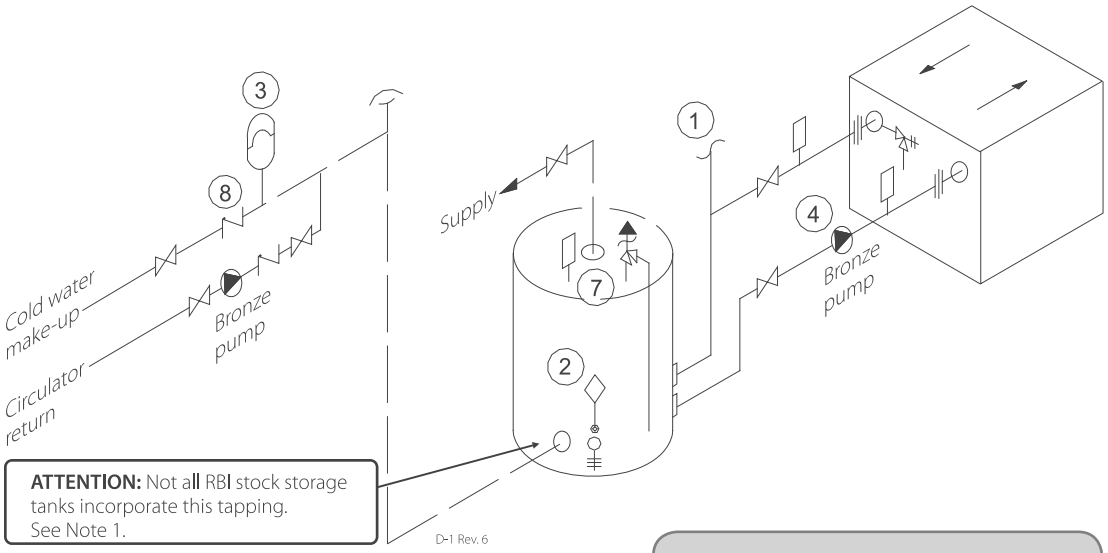


Table 9 Futera XLF Pumping Performance Requirements

Water hardness →	**Soft**			**Normal**			**Hard**		
Heat exchanger type →	Cupro-nickel			Copper			Cupro-nickel		
Boiler model	GPM	ΔP	ΔT	GPM	ΔP	ΔT	GPM	ΔP	ΔT
MW-2500 MW-3000	**SPECIAL REQUIREMENTS (Call factory or representative)**			210	9.73	25.0	262	14.54	20.0
MW-3500 MW-4000				210	10.40	33.0	262	16.90	27.0

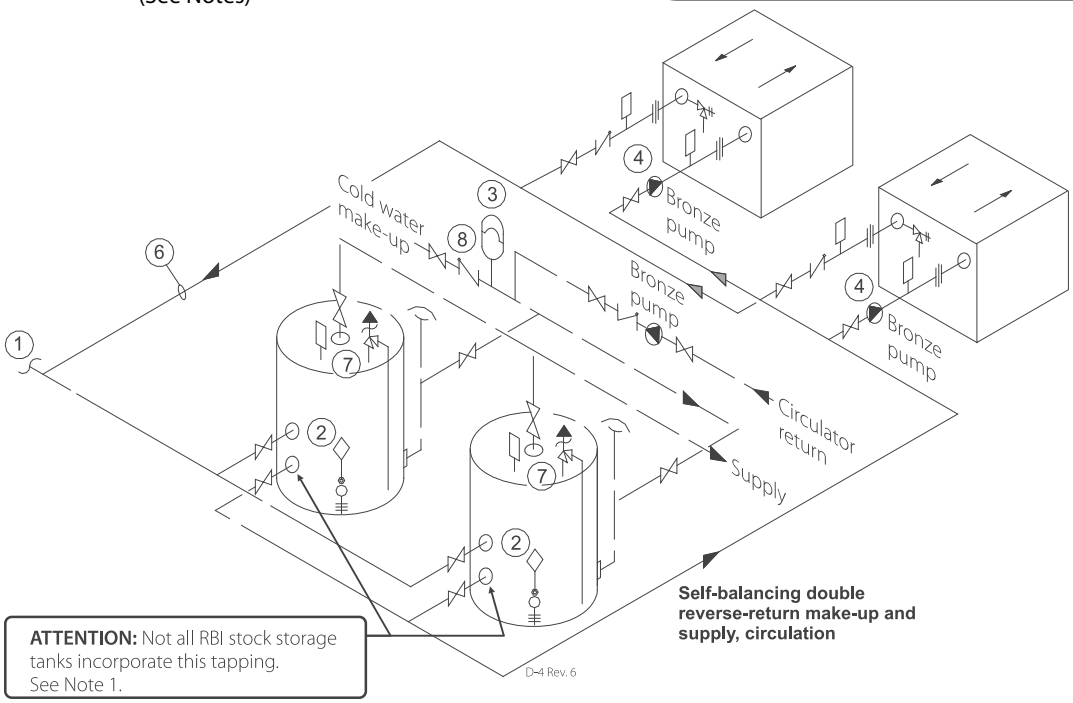
ΔT = Temperature change = (Outlet temp – Inlet temp) in °F
ΔP = Head loss = (Inlet pressure – Outlet pressure) in feet of water column
To achieve the proper flow rate, adjust outlet valve on heater piping to obtain correct ΔT
Call factory if grains of hardness is less than 3 or greater than 24.

Figure 14 Typical Water Heating Piping (MW Models Only) (See Notes)



NOTICE These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

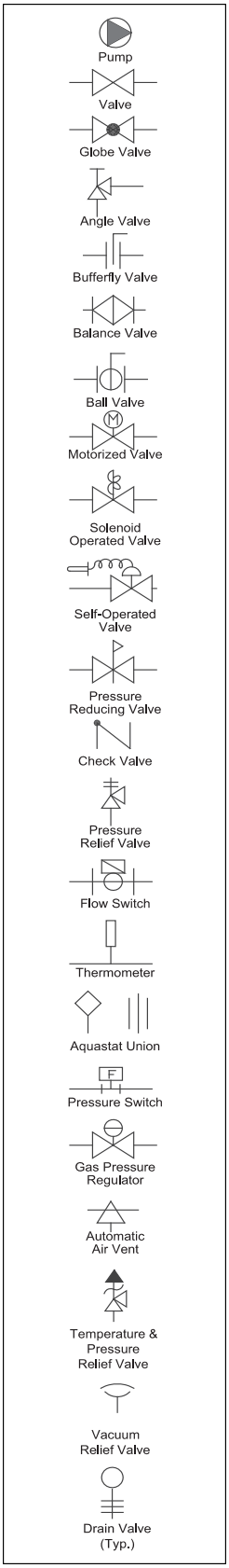
Figure 15 Multiple Water Heating Piping (MW Models Only) (See Notes)



NOTES:
1. Optional cold water make up and recirculation line location.
2. When using intermittent pump and pump delay, locate remote aquastat well in lower 1/3 of tank. Install aquastat with heat sensing compound.
3. Thermal expansion tank may be required, check local codes.
4. When using optional factory mounted pump, max pipe length 30' total, 6-90° elbows, full pipe size.
5. CAUTION: MEASURE WATER HARDNESS AND pH AT JOB SITE.
6. The pH and water hardness must be measured before selecting heat exchanger and pump. Consult the Heat Exchanger Graph and Pumping Performance Table before making selection.
7. Common piping must be sized for maximum combined heater flow.
8. Hot water tanks should be equipped with a combination temperature & pressure relief valve.
9. MA Code requires an 1/8" hole in check valve to compensate for thermal expansion.

LEGEND:

Boiler Loop ——————
Supply Loop — — — —



GAS SUPPLY PIPING

WARNING Check the boiler/water heater rating plate to make sure that the boiler/water heater is for the type of gas that will be used. If it isn't, do not connect the boiler/water heater to the gas supply. Gas supply piping must be in accordance with the National Fuel Code, ANSI Z223.1-latest revision or applicable provisions of the local building codes. Canadian installations must comply with CAN/CGA B149.1 or B149.2 Installation Code. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

The Futera XLF comes from the factory ready to be piped to the gas supply. If for any reason the boiler/water heater is not for the type of gas available at the installation site, call your RBI representative to resolve the problem.

NOTICE With all units operating the gas supply pressure (natural gas) at the safety shutoff valve inlet must be:
Minimum 3.5 inches, 88.9 mm, W.C.
Maximum 14 inches, 356 mm, W.C.

Tables 10 and 11 should be used to ensure that the gas supply piping is sized properly. If more than one appliance is supplied by the same supply pipe, the piping must be sized based on the maximum possible demand. Do not neglect the pressure drop due to pipe fittings. Table 10 should be used in conjunction with Table 11 to ensure that the gas supply piping has the capacity to meet the demand.

Figure 16 depicts the proper way to connect the boiler/ water heater to the gas supply piping. The manual shut-off valve MUST be installed in the supply piping. It should be installed 5 ft, 1.5 m above the floor where required by local codes. Provide a sediment trap at the bottom of the vertical section of the gas supply pipe upstream of the gas controls.

Figure 16 Gas Supply Piping

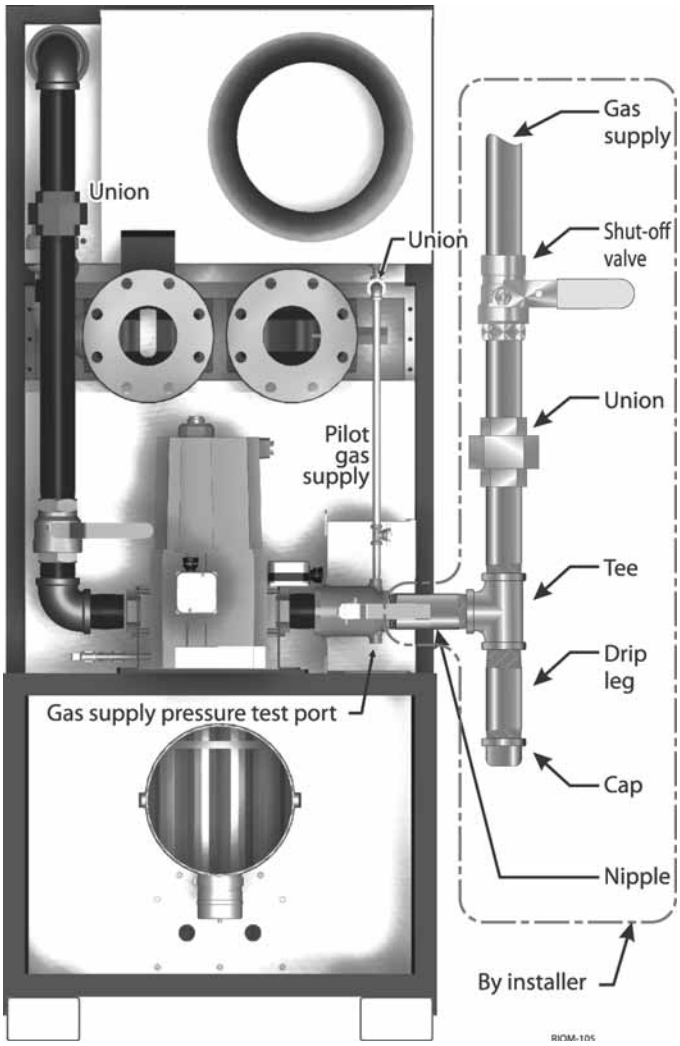


Table 10 Gas pipe capacities (natural gas)

Maximum pipe capacity in ft³/hr, based on 0.60 specific gravity natural gas at a pressure of 0.5 psig or less and a 0.5" w.c. pressure drop, for iron pipe with nominal size below, and for total equivalent length (in feet):															
Pipe size	10	20	30	40	50	60	70	80	90	100	125	150	175	200	250
2"	4,020	2,760	2,220	1,900	1,680	1,520	1,400	1,300	1,220	1,160	1,020	928	854	794	704
2½"	6,400	4,400	3,530	3,020	2,680	2,430	2,230	2,080	1,950	1,840	1,630	1,480	1,360	1,270	1,120
3"	11,300	7,780	6,250	5,350	4,740	4,290	3,950	3,670	3,450	3,260	2,890	2,610	2,410	2,240	1,980
4"	23,100	15,900	12,700	10,900	9,660	8,760	8,050	7,490	7,030	6,640	5,890	5,330	4,910	4,560	4,050
5"	41,800	28,700	23,000	19,700	17,500	15,800	14,600	13,600	12,700	12,000	10,600	9,650	8,880	8,260	7,320
6"	67,600	46,500	37,300	31,900	28,300	25,600	23,600	22,000	20,600	19,500	17,200	15,600	14,400	13,400	11,900
Note: For propane piping — Multiply the gas volume capacities above by 0.62 for propane flow capacities in ft³/hr. Multiply the propane flow capacity by 2500 Btu/ft³ to determine the propane Btu/hr capacity for a given pipe size and length.															

Table 11 Equivalent length (feet) for typical fittings

Pipe size	Fitting or valve			
	90° elbow	Tee (branch flow)	Gate valve	Gas cock
2"	5.2	10.3	1.2	3.0
2½"	6.2	12.3	1.4	3.5
3"	7.7	15.3	1.8	4.5
4"	10.1	20.2	2.4	6.0
5"	12.6	25.2	2.9	7.3
6"	15.2	30.4	3.5	13.4
Equivalent lengths above are for threaded fittings. Multiply values above by 0.75 for flanged fittings.				

A ground joint union should be installed between the boiler gas controls and the supply piping. Each of these items are needed to ensure long life and ease of servicing. Always use a pipe sealant that is suitable for use with LP gas.

CAUTION Always use a wrench on the gas valve body when making gas connections to it. Never over-tighten the piping entering the gas valve body or gas valve failure may result!

When applicable, provisions for vent, bleed and gas relief lines must be made in accordance with the latest revision of ANSI Z223.1/NFPA 54. The main Dungs gas valve supplied with boiler/water heater does not require external venting.

Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler. All gas connections MUST be leak tested before putting the boiler into operation.

WARNING Never use an open flame to test for gas leaks. Always use an approved leak detection method. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

Whenever the gas supply piping is pressure tested the boiler/water heater gas controls must be protected. If the test pressure is equal to, or less than 1/2 psig, 3.5 kPa isolate the boiler/water heater by closing it's manual shut off valve, see Figure 16, page 22. If the test pressure is greater than, or equal to 1/2 psig, 3.5 kPa, disconnect the boiler/water heater and its individual shut-off valve.

ELECTRICAL WIRING

Electrical power connections

CAUTION Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation!
Verify proper operation after servicing.

Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE The electrical connections to this boiler/water heater must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, ANSI/NFPA-70. Installation should also conform with CSA C22.1 Canadian Electrical Code Part I if installed in Canada.

Install a separate 240 volt circuit breaker for the boiler/water heater . (See Table 12). A properly rated shut-off switch should be located at the boiler/water heater. The boiler/water heater must be grounded in accordance with the authority having jurisdiction, or if none, the latest revision of the National Electrical Code, ANSI/NFPA-70.

Table 12 Futera XLF Electrical Requirements

Futera XLF Model	Required Circuit Breaker (amps)	FLA *
2500-4000	25	17
* Use separate circuit breaker that is properly sized for pump and pump contactor.		

Line voltage field wiring of any controls or other devices must conform to the temperature limitation of type TEW or equivalent at 189°F, 105°C. Use appropriate wiring materials for units installed outdoors. The wire size must be compatible with the total amp draw of the circuit.

Refer to the wiring diagram supplied with the boiler/water heater for proper wiring connections and wire size.

GENERAL OPERATION

WARNING Before proceeding read and fully understand the instructions contained in this manual. Do not attempt to operate this boiler/water heater if it has not been installed in accordance with the guidelines set forth in this manual. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance. Do not interrupt water flow through the boiler/water heater.

Hydronic heating boilers

Open the make-up water valve and slowly fill the boiler and all of the radiation with water. Ensure that all bleed and drain valves are closed.

Adjust the make-up water pressure regulator so a minimum 12 psig, 82.7 kPa system pressure is maintained at the highest point in the system piping. If a make-up water pump is used adjust it to maintain a minimum 12 psig, 82.7 kPa system pressure.

Open the system bleed and drain valves, one at a time, to purge the air trapped in the heating system piping.

With the boiler off, run the system pump for at least 30 minutes and bleed the system piping using the bleed valves. If strainers are used in the system piping, the make- up water valve should be closed and the strainers checked and cleaned.

The system expansion tank should be checked to ensure that the correct water level in the tank is maintained. The tank should be less than half full of water with the system full and adjusted to the correct operating pressure.

Start the boiler as described in the "Operating Instructions" section. Run the boiler for at least an hour. The system pump(s) and all radiation units must be operated during this time. Ensure that the make-up water valve is open.

Shut the boiler off and open the bleed valves to purge the air trapped in the heating system piping. Close the make-up water valve and check and clean the strainers and make-up water pressure reducing valve.

Open the make-up water valve and adjust the system pressure if necessary. The system should be checked and bled after three days of operation.

WIRING & CONTROL SET-UP

WARNING Follow the instructions in the Futera XLF Control installation and operation instruction manual shipped with the boiler to wire the boiler and set up the HeatNet control. The control must be set up before attempting to fire the boiler.

See Figure 17, page 25 for location of electrical components.

In addition to the information in the Futera XLF Control IOM, see the following information on controls and interlocks.

CONTROLS & INTERLOCKS

Low Water Cutoff

If the boiler is to be installed above radiation or if required by other codes or regulations, install a low water cutoff in appropriate piping. Wire the switch to the "Interlock" contacts as illustrated on "Field Wiring" schematic. Ensure that the low water cutoff device(s) will function properly.

Operating Control

The operating control should be set to the lowest setting that will satisfy the consumer's needs.

WARNING Setting the thermostat or operation control too high can result in scalding resulting in severe personal injury!

High Limits (Aquastats)

The high limits are located in the top control area of the boiler/water heater. Remote capillary bulbs run to wells on the outlet side of the supply header. The high limit can be reset by depressing the red button.

The water heater high limit should be set to a minimum of 20°F, 11°C higher than the operating control. Refer to the HOT WATER SUPPLY section for the proper supply water temperature.

Flow Switch

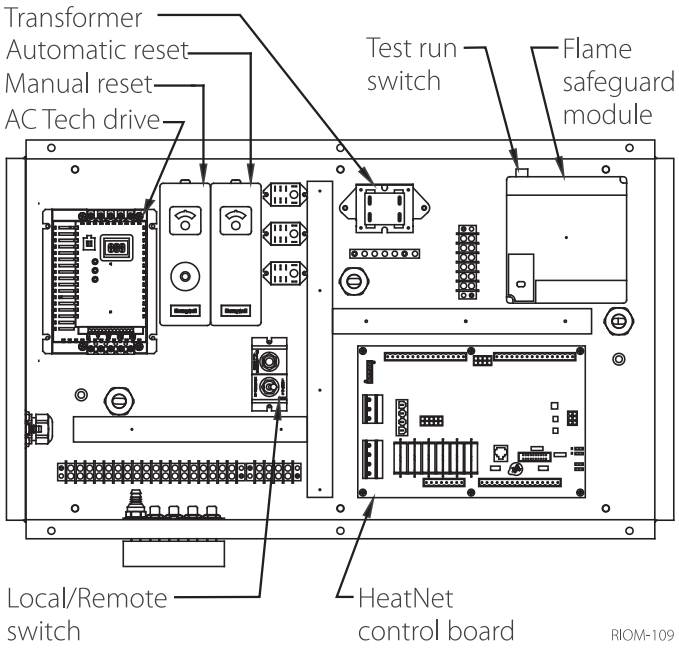
A flow switch is provided in the water outlet piping to prevent the boiler/water heater from firing without adequate water flow through the heat exchanger.

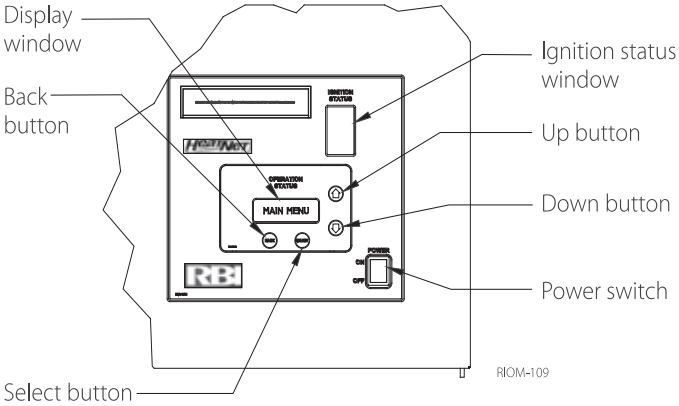
PROPANE GAS

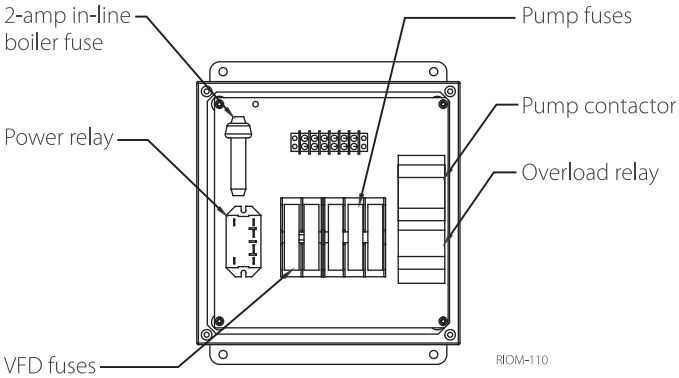
WARNING Propane gas may not always be detected by smell. Propane gas is heavier than air and can collect in low areas.

Propane gas can ignite or explode if an ignition source is present and result in death, serious injury and property damage!

Figure 17 HeatNet Control Panel







SEQUENCE OF OPERATION

NO DEMAND

Standby

1. The boiler is idle with no interlocks in the fault condition.

DEMAND

Pre-Purge

1. The blower operates at purge RPM. The water flow interlock must 'make' within 15 seconds after the demand signal is initiated.
2. The Honeywell 7800 starts a 10 second purge delay once the air prove switch contacts close.

Pilot Run - %Input

1. The blower operates at minimum ignition setting. See the calibration section in the "HeatNet Control-IOM" to enter the calibration menus.
2. The ignition transformer is energized. The pilot solenoid valve opens for the 10 second pilot ignition trial.

Main Run %Input

1. The main gas valve opens.
2. The ignition transformer is de-energized.
3. The pilot solenoid valve closes.
4. The blower stays at the minimum input setting for 3 seconds then operates at demand % input. See the calibration section in the "HeatNet Control IOM" to enter the calibration menus.

NO DEMAND

Post-Purge

1. The main gas valve closes.
2. The blower operates at purge RPM for 10 seconds.
3. The boiler is idle with no interlocks in the fault condition.

WARNING The following start-up procedure assumes that all water piping, gas piping and electrical connections are correct as stated in this manual and the installation meets all State, Local, and City codes.

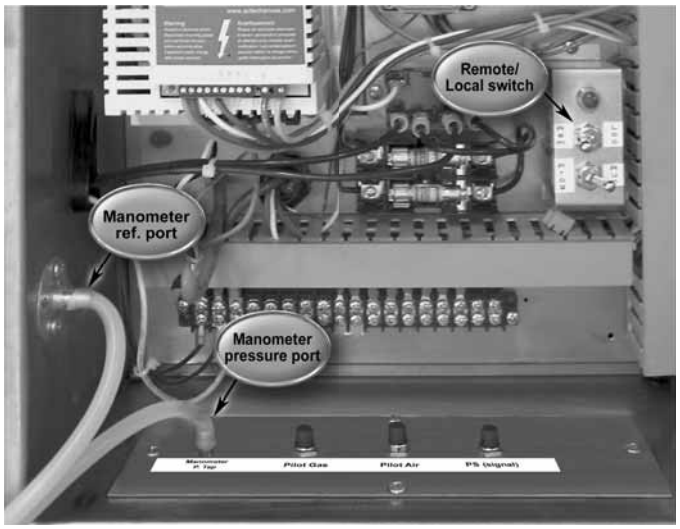
NOTICE See the Futera XLF Control IOM for troubleshooting information and control operation.

OPERATING INSTRUCTIONS

Operating instructions

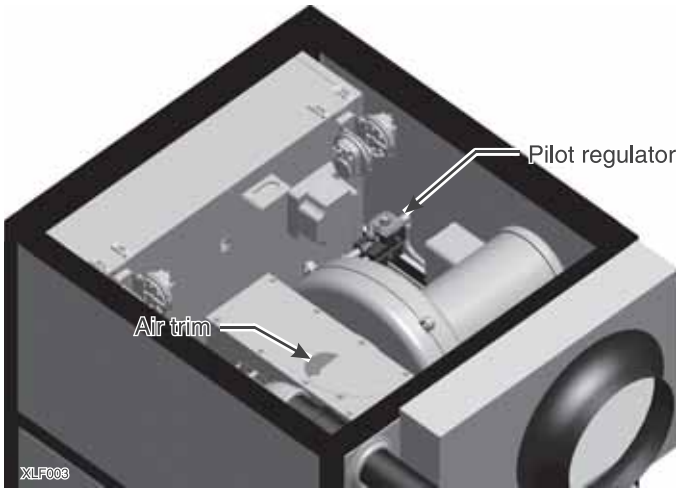
1. If, at any time, the boiler will not operate properly, follow the instructions "TO TURN OFF GAS TO APPLIANCE," page 28, and call your service technician or gas supplier.
2. Turn off all electrical power to the boiler.
3. Close main gas shut-off valve (field supplied), Figure 16, page 22.
4. Purge the gas piping up to the boiler's manual gas valve (located ahead of the main gas valve). When the bleeding is complete, check all gas joints up to the gas valve for leaks.
5. Wait five (5) minutes to clear out any gas.
6. Make sure all limits, pressures switches and safety device contacts are closed.
7. Open the main gas shut-off valve.
8. Disable any external call for heat, such as from a building management system or remote operating controller.
9. Toggle the remote/local switch (in control cabinet — see Figure 18) to **REMOTE**.
10. Turn on electrical power to the boiler.
11. Turn the power switch on the front of the boiler control cabinet to **ON**.
12. The HeatNet display will light up when the power is on. If all interlocks are properly closed, the display will say **STANDBY**. If not, refer to the XLF HeatNet Control IOM for troubleshooting.
13. Slide the HeatNet control's low fire switch (on HeatNet control board) to the **LOW FIRE** position.
14. The boiler will begin the start-up sequence.
15. Allow the boiler to pre-purge and enter the pilot ignition cycle.
16. If pilot lights (indicated by a good flame signal 5.0 V DC) proceed to step 18. (See Honeywell R7800 literature for use of a meter to check flame signal if keypad readout is not available.)
17. If pilot is unstable (indicated by a low or erratic flame signal causing pilot flame failure), toggle the low fire switch to **DISABLE**, then back to **ENABLE** to start another cycle (reset the Honeywell control if necessary). Repeat for one or two more times to ensure the pilot line is purged of all air. If pilot is still unstable, the pilot gas pressure may need to be increased. See step 18.
18. Pilot pressure adjustment:
    a. Switch the Honeywell control to **TEST** position within the first 10 seconds of the pilot ignition sequence.
    b. Connect one side of a manometer or pressure gauge to the manometer pressure port (barbed) on the pressure test manifold (located inside control panel). See Figure 18. Leave the other side of the manometer open to the room. DO NOT connect it to the reference port (left side of panel).

Figure 18 Manometer connections to the test manifold (in control cabinet)



    c. Measure pilot gas pressure by pressing and holding the service valve marked **PILOT GAS**.
    d. Set pilot gas pressure to 3.0 inches w.c. (± 0.5 inch) by adjusting the pilot gas pressure regulator, inside the air box. Access from the boiler top cover. See Figure 19.

Figure 19 Access to air trim adjustment and pilot regulator



    e. Check pilot air pressure using service valve marked **PILOT AIR** .
    f. Pilot air pressure should be 0.60 inches w.c. (± 0.10 inches).

WARNING Combustion readings must be in the range specified in the following instructions. Adjust the boiler as necessary to ensure proper combustion.

Verify low fire operation

1. Connect a manometer or Magnehelic gauge with the pressure side to the manifold pressure port and the other to the manifold reference port. See Figure 18, page 26 for locations.
2. Set Honeywell R7800 control to RUN position. The boiler will operate at low fire because the low fire switch is in the low fire position.
3. Measure the flue gas CO_2 with the boiler running at low fire. Set low fire CO_2 to 8.0% – 8.5% by adjustment on the Dungs valve using a 3mm Allen wrench.
   a. Turn the wrench in small increments (10 degrees at a time).
   b. Allow time after each adjustment for the boiler to reach steady state.
4. After setting the CO_2, measure the pressure signal, **Ps**.
   a. Press the **Ps (signal)** button and read the pressure. The pressure at low fire should be as shown in Figure 13.
   b. If the pressure is outside this range, follow instructions in the XLF Control IOM to calibrate the firing rate. Increase rate if the pressure signal is low, or decrease rate if the signal is high.
   c. Return to step 1 to adjust low fire CO_2 after changing low fire firing rate.

WARNING If using a U-tube manometer turned sideways for low pressure readings, you MUST turn the manometer upright before attempting to measure pressures at other than low fire. Pressure signal will reach up to 9 inches when the boiler is at high fire, and can cause fluid to be pulled out of the manometer into the boiler. Should this occur, immediately shut down the boiler and contact the factory for procedure. Preferably, use a Magnehelic gauge instead of a U-tube manometer to measure the pressure to avoid this potential hazard.

Table 13 Pressure signal (Ps) (Nat Gas)

Firing rate %	XLF-2500	XLF-3000	XLF-3500	XLF-4000
	Signal Inches w.c.	Signal Inches w.c.	Signal Inches w.c.	Signal Inches w.c.
100%	-9.40	-5.50	-5.80	-8.70
20%	-0.60	-0.25	-0.40	-0.40
To determine signal in mm w.c., multiply signal pressure by 25.4.				

For LP Gas: All units are tested at factory. LP Combustion Values are located on Combustion Data label.

WARNING To ensure proper boiler operation, boilers that use room air must not be fired at less than 33 % input.

5. Observe the burner flame after setting low fire. Make sure the flame is stable, but not too tight on the burner (causing infrared operation).

WARNING **DO NOT LEAVE THE BURNER IN AN INFRARED STATE**. A few random speckles of red are acceptable, but large concentrations of spots or large areas of red are not. If large amounts of red concentrations are observed, verify combustion readings.

NOTICE Leave the manometer connected to the test manifold. It will be needed for high fire operation testing.

Verify high fire operation

1. Jumper the AA terminals on the HeatNet board and allow the boiler to rise to maximum (100%) input.
2. Allow the boiler to reach steady state combustion at high fire.
3. Verify high fire blower speed as follows:
   a. With the manometer (or gauge) connected to the test manifold, press the **Ps (signal)** button and read the pressure.
   b. The pressure at low fire should be as shown in Figure 13.
   c. If the pressure is NOT correct, follow step 4.
4. If the high fire signal pressure is not correct:
   a. Remove the jumper on A-A. The boiler will return to low fire.
   b. Follow the instructions in the XLF Control IOM to calibrate the high fire firing rate. (Slide the HeatNet control calibrate switch to **CAL**. Follow the Control IOM procedure to navigate to the HeatNet control calibration screen.)

WARNING The maximum firing rate value in the HeatNet control is factory set at 90%. At this setting, at sea level, and with typical vent length, the **boiler will be at rate**. DO NOT increase the HeatNet control's maximum rate setting above 90% unless needed for high altitude installations.

   c. If **Ps** is too high, reduce the HeatNet control's maximum firing rate setting by 2%. Then slide the calibration switch to **NORMAL** and exit the HeatNet control's calibration screens. Replace the jumper on A-A and allow the boiler to return to high fire. Return to step 2 to repeat the process. If necessary, repeat this sequence, reducing the firing rate by 2% each time.
   d. If **Ps** is too low, increase the firing rate setting by 2%. Then slide the calibration switch to **NORMAL** and exit the HeatNet control's calibration screens. Replace the jumper on A-A and allow the boiler to return to high fire. Return to step 2 to repeat the process. If necessary, repeat this sequence, increasing the firing rate by 2% each time.
   e. Check the pressure signal again. If the signal is now correct, reconnect the jumper on AA and proceed to step 5.
   f. If the pressure signal is still not correct, verify that the air trim adjustment (see Figure 19, page 26) is in the half-open (factory setting) position. If it is at factory setting, you will need to contact technical support at the factory to troubleshoot the pressure signal issue.
5. If the pressure signal is correct, measure the flue gas CO_2. It should be between 9% and 9.5%.
   a. If CO_2 is correct, proceed to step 6.
   b. If CO_2 is not within this range, adjust the air trim adjustment slightly (see Figure 19, page 26) on top of mixing box to achieve a CO_2 of 9% - 9.5%.
   c. If adjusting the air trim adjustment does not correct the problem, contact technical support at the factory to troubleshoot the problem.

6. If CO_2 and pressure signal are correct, allow the boiler to reach steady state and verify supply gas pressure and check input rates as explained in the Gas Supply Piping section.
7. Remove jumper on AA and allow boiler to settle into minimum input. Observe the combustion readings to ensure the boiler is operating correctly.
8. When finished, disable the low fire hold switch and replace test ports to normal state. Remove the manometer connections and close the control panel door.
9. The Futera XLF boiler allows for many modes of operation and control methods. Reference the XLF HeatNet Control IOM.

TO TURN OFF GAS TO APPLIANCE

1. Set the operating control to its lowest setting.
2. Turn off all electric power to the boiler if service is to be performed.
3. Close the manual main and pilot gas shut-off valves.

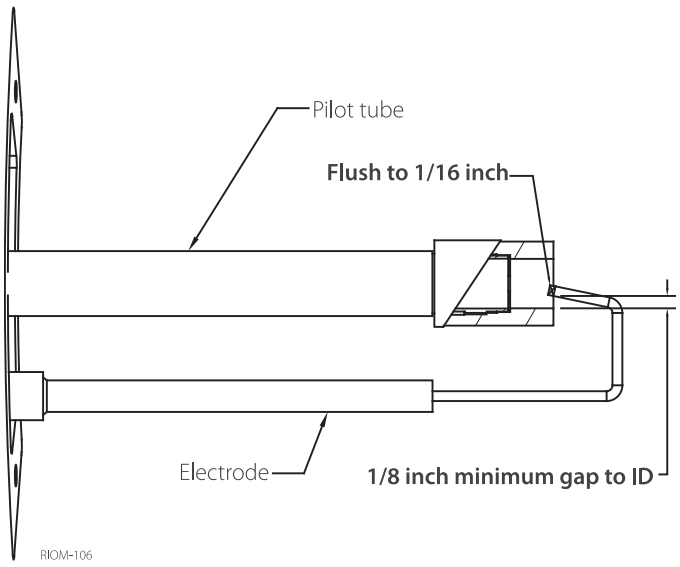
CHECKING & ADJUSTMENTS

WARNING Proper polarity of the ignition transformer wiring is import. Improper wiring of the ignition transformer can result in an explosion causing extensive property damage, severe personal injury or death!

Spark gap

With the main and pilot gas manual valves in the closed position energize the unit. Look through the sight glass in the pilot tube to observe the trial for ignition. Make sure that the spark is strong and continuous. If not, check and adjust the spark gap as shown in Figure 20.

Figure 20 Spark Gap



Pilot adjustment

1. The pilot pressure has been factory set at 3 inches w.c., and shouldn't need adjustment.
   a. With the boiler powered, generate a call for heat.
   b. When the prepurge is complete the ignition/pilot trial will begin.
2. To adjust the pilot the following steps must be taken:
   a. Put the Honeywell RM7800 test switch in the test position. The control will hold in the ignition/pilot sequence, allowing you to check the pressure.
   b. Connect one side of a manometer or pressure gauge to the manometer pressure port (barbed) on the pressure test manifold (located inside control panel). See figure 18. Leave the other side of the manometer open to the room. DO NOT connect it to the reference port (left side of panel).
   c. Measure pilot gas pressure by pressing and holding the service valve marked **PILOT GAS**.
   d. Set pilot gas pressure to 3.0 inches w.c. (± 0.5 inch) by adjusting the pilot gas pressure regulator, inside the air box. Access from the boiler top cover. See Figure 19.
   e. Check pilot air pressure using service valve marked **PILOT AIR**.
   f. Pilot air pressure should be 0.60 inches w.c. (± 0.10 inches).

CAUTION Never force the regulator adjustment screw beyond the stop limits or damage to the regulator will occur!

Required gas pressure

Provide gas supply pressure at inlet to boiler gas train as follows:

Gas supply pressure (Nat/LP)		
	Inches water column	mm water column
Minimum (in W.C.)	3.5	88.9
Maximum (in W.C.)	14	356

1. Measure pressure when the boiler is firing at full rate. Low gas pressure could indicate undersized gas line or insufficient gas supply.
2. Static and operating gas pressure required at the gas valve inlet is listed in the Table above.

WARNING If the gas pressure is above the limit in the table below, a lock-up style gas pressure regulator suitable for dead-end service, (such as an Equimeter or Fisher) must be installed to prevent increase (creep) of gas pressure when the units are not operating.

This pressure regulator (supplied by others) may be installed at the service entrance to each unit or a "master" regulator sized to handle multiple units may be utilized. Consult local gas utility or regulator manufacturer for recommendations to meet specific job site requirements.

Input rate — Natural gas

Gas appliances are rated based on sea level operation with no adjustment required at elevations up to 2000 ft, 610 m. At elevations above 2000 ft, 610 m input ratings should be reduced by 4% for each 1000 ft, 305 m.

Check the input rate as follows:

1. Turn off all other gas appliances that use the same gas meter as the boiler/water heater.
2. Call your gas supplier and ask for the heating value of the gas.
3. Start the boiler/water heater and let it run for 15 minutes.
4. Using the gas meter and a stopwatch, clock the time that it takes to burn 10 ft^3, 0.28 m^3 of gas and divide this time by 10.
5. Insert the heating value and the time, in seconds, into the formula below.
6. Input = (heating value, Btu/hr)(3600)/(time, seconds)
7. If the computed rate deviates by more than 5% from the rated input value of the unit, consult factory.

CAUTION Never increase the input to the boiler/water heater above that for which it is rated. Doing so can cause premature failure of the boiler!

MAINTENANCE

WARNING Disconnect electrical power and close the manual gas shut off valve before performing maintenance or severe personal injury may result!

CAUTION Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes. Improper servicing or adjustment can damage the boiler/water heater!

The boiler/water heater must be cleaned and inspected at least once a year and before each heating season. Make sure that the burner and ignition components are free from dust, soot, dirt, corrosion or other deposits that would impair the boiler/water heater 's performance. Refer to Figure 20, page 28 for component identification.

CAUTION Improper burner servicing can result in premature burner failure voiding the warranty!

Pilot and burner removal

1. Close the manual shutoff valves in the gas supply line and turn off electrical power to the boiler/water heater.
2. Remove the jacket top panel.
3. Remove wires from the spark rods and remove the UV sensor from the transition piece.
4. Remove the pilot assembly:
   a. Disconnect the compression nut at the front of the pilot block.
   b. Remove the pilot gas tubing.
   c. Remove the (2) screws from the pilot block.
   d. Remove the pilot assembly.
5. Disconnect the flexible gas line from the manifold.
6. Disconnect the wires to the fan and remove the (2) bolts and the fan hold-down plates that secure the fan to the transition piece.
7. Lift and remove the fan housing from the boiler/water heater, taking care not to damage the spark rods and or their alignment.
8. Remove the four nuts holding the transition piece to the heat exchanger.
9. Remove the transition piece, taking care not to damage the O-ring.
10. Remove the burner, taking care not to damage the gasket.
11. Replace all components after servicing.

Heat exchanger inspection

1. Close the manual shutoff valves in the gas supply lines and turn off electrical power to the boiler/water heater.
2. Remove burner following the instructions in the Burner Removal section.
3. Remove the front jacket panel and combustion chamber door.
4. Inspect the inside and outside of the heat exchanger for signs of damage, sooting or corrosion.
5. The outside surfaces of the copper tubes should be free of any soot deposits. A slight black smudge is normal with some types of gases. Black soot indicates poor combustion. Green deposits indicate condensation due to low return water temperatures. In either case the heat exchanger must be cleaned thoroughly and the problem resolved before the boiler/water heater is returned to service.
6. If there are no signs of damage, sooting or corrosion, reassemble the unit following the previous steps in reverse order.
7. A badly corroded or damaged heat exchanger must be replaced, see the Heat Exchanger Repair & Replacement section.

Heat exchanger cleaning

1. Close the shut off valves in the inlet and outlet piping. On heating systems close the system fill valve and relieve the system pressure from the boiler by carefully lifting the relief valve or opening the drain valve.
2. Disconnect the boiler/water heater from the system piping.
3. Remove the eight bolts on the rear pipe enclosure panel.
4. Remove the front jacket panel and combustion chamber door.
5. Slide the heat exchanger out of the unit.
6. Remove the "V" baffle straps and "V" baffles.
7. Thoroughly clean the heat exchanger with water from a high-pressure hose. Use a soft bristle brush if necessary.
8. Replace the cleaned heat exchanger and other components in the reverse order of their removal.

Heat exchanger repair & replacement

1. A leaking or otherwise damaged tube(s) can be replaced as outlined in steps 2 through 8.
2. Remove the heat exchanger from the boiler/water heater as outlined in the Heat Exchanger Cleaning section.
3. Remove the pipe plugs from the inlet/outlet and return headers opposite from the ends of the tube(s) being replaced.
4. Carefully cut the damaged tube(s) in half, taking care not to damage the adjacent tubes and remove.
5. Install and swage/expand in place the new tube(s).

6. Replace the pipe plugs using a suitable thread sealant on each one.
7. Sagging or distorted heat exchanger tubes are an indication of low water flow through the system. A damaged heat exchanger must be replaced and the condition that caused the damage resolved before the boiler/water heater is returned to service.
8. Replace the heat exchanger and other components in the reverse order of their removal.

Air intake & vent system

Thoroughly inspect the air intake and vent systems for any signs of blockage, corrosion or leakage. Immediately replace any unsound vent system piping. Inspect the air filter and wash with warm water and soap if dirty.

Controls

Use the "GENERAL OPERATION" and "CHECKING AND ADJUSTMENTS" sections of this manual for reference.

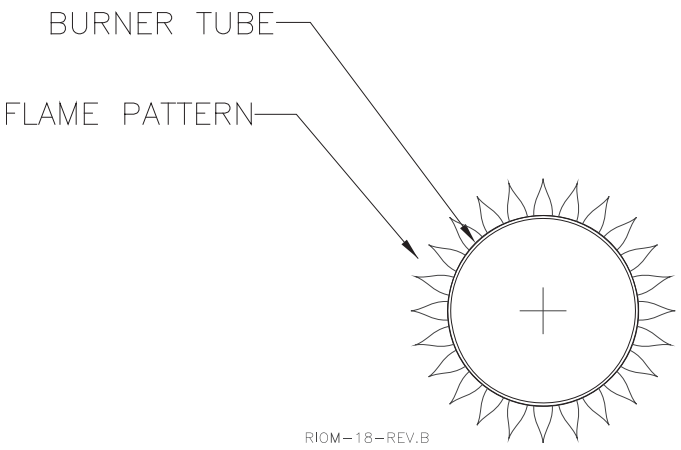
1. Check the operating controls for proper operation.
2. A float type low water cutoff device must be flushed out per the manufacturers' instructions.
   a. The probe on a probe low water cut off must be removed, cleaned and inspected at least once a year.
   b. Ensure that the low water cutoffs operate properly. If not, replace them.
3. The flow switch contacts must be open when water flow is not present.
4. The relief valve should not weep or discharge water at normal system pressure. If it does, contact a qualified service technician to have it inspected.

WARNING NEVER try to clean or repair the relief valve! If the valve fails to operate properly, have it replaced!

5. The aquastat high limit controls the maximum water temperature in the boiler.
   a. If the water temperature reaches the set temperature before the demand for heat has been met, the aquastat high limit should shut the boiler off.
   b. The water temperature should never exceed the maximum set point of 250°F, 121°C, for boilers and 210°F, 99°C for water heaters.
   c. The aquastat high limit cannot be repaired. If it fails to function properly, replace it.
6. Visually check the pilot and main burner flames to ensure proper operation, see Figure 21.

WARNING A yellow, floating flame indicates a lack of combustion air. Do not operate the boiler/water heater until the problem is solved or severe personal injury or death may occur!

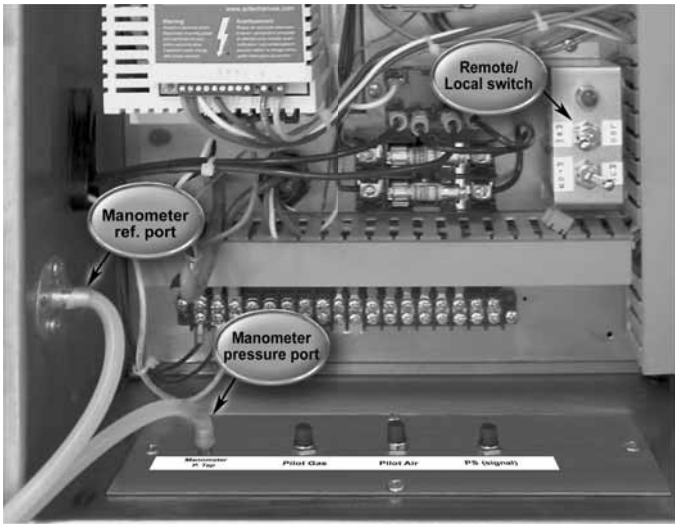
Figure 21 Main Burner Flame



Manometer test port manifold

1. The Futera XLF includes a manometer test manifold. Connect the manometer pressure hose to the Pressure Tap port shown in Figure 22.

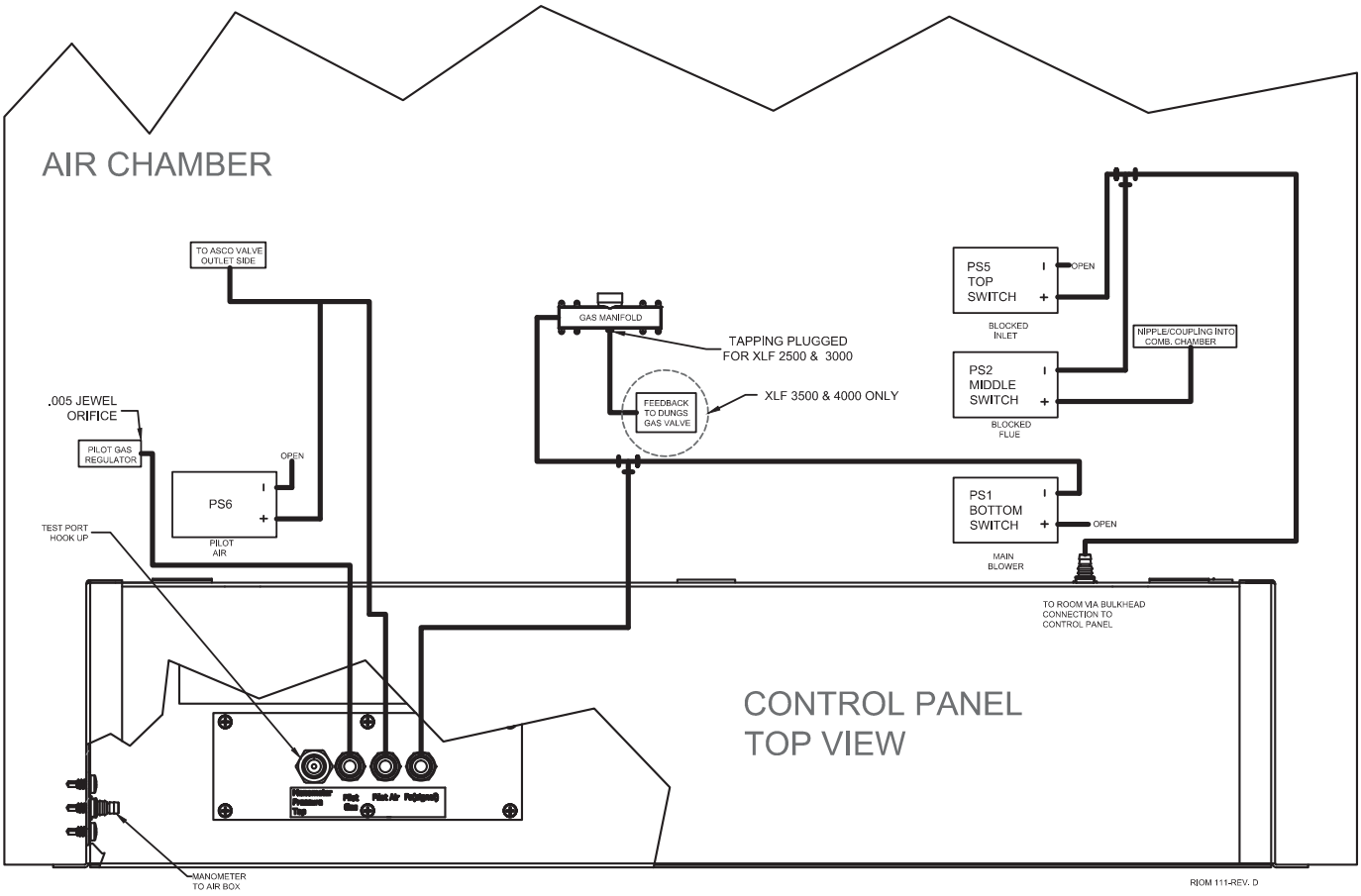
Figure 22 Manometer connections to manifold



2. For pilot gas pressure and pilot air pressure readings, DO NOT connect the other side of the manometer. Leave the other side open to room pressure.
3. For Ps (pressure signal) readings, connect the other side of the manometer to the manometer reference port as shown in Figure 22. These pressure signals may be used for troubleshooting when specified by factory support.
4. Figure 23, page 32 shows the sensor hose connections inside the Futera XLF air box.

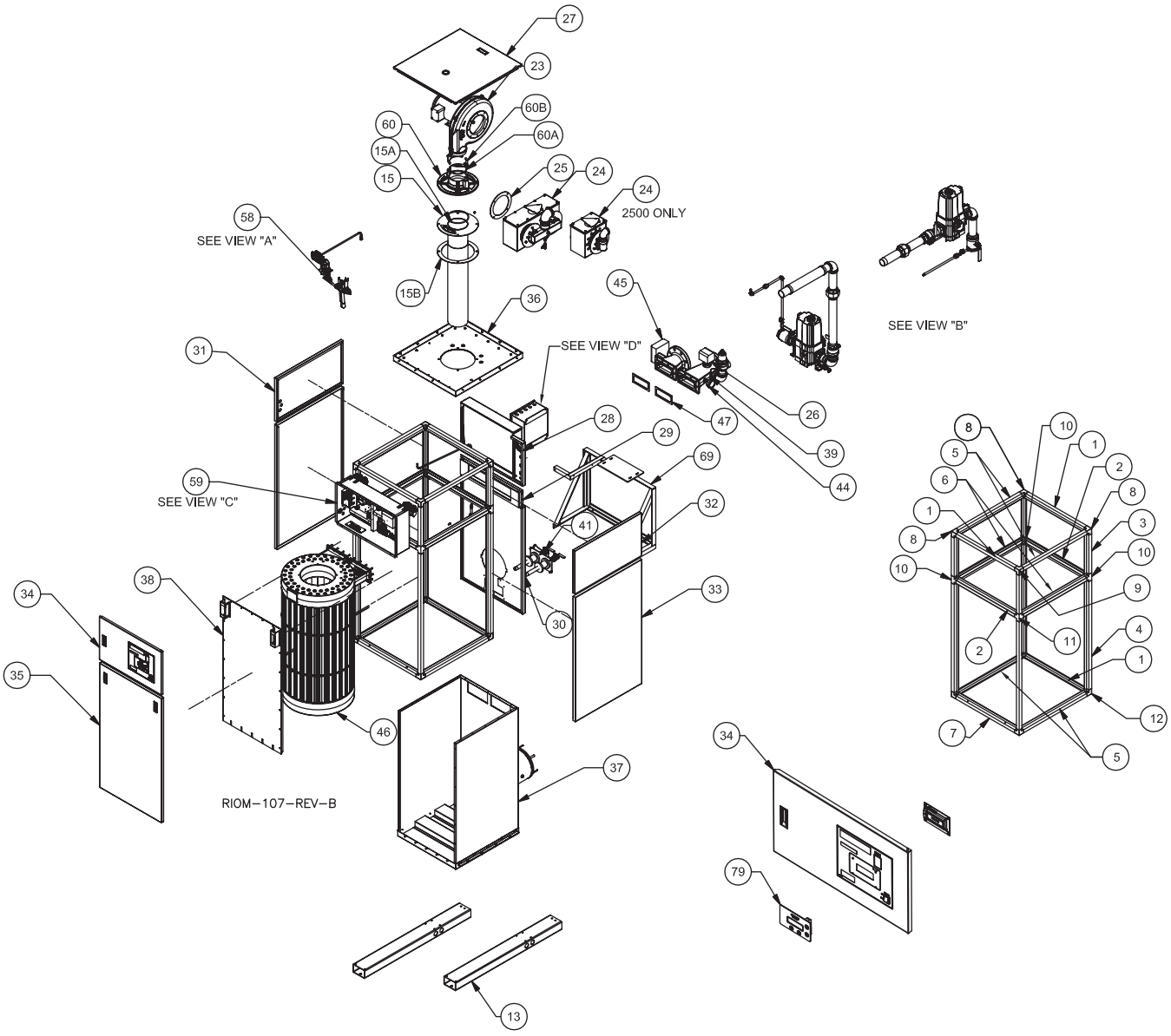
Figure 23 Futera XLF pressure sensor hose routing

SWITCH SETTINGS IN "W.C."					
SWITCH	FOR	2500	3000	3500	4000
PS1	MAIN BLOWER	(-) 0.20	(-) 0.20	(-) 0.20	(-) 0.20
PS2	BLOCKED FLUE	(+) 3.0	(+) 3.0	(+) 2.0	(+) 2.0
PS5	BLOCKED INLET	(-) 2.0	(-) 2.0	(-) 2.0	(-) 2.0
PS6	PILOT AIR	(+) 0.36	(+) 0.36	(+) 0.36	(+) 0.36



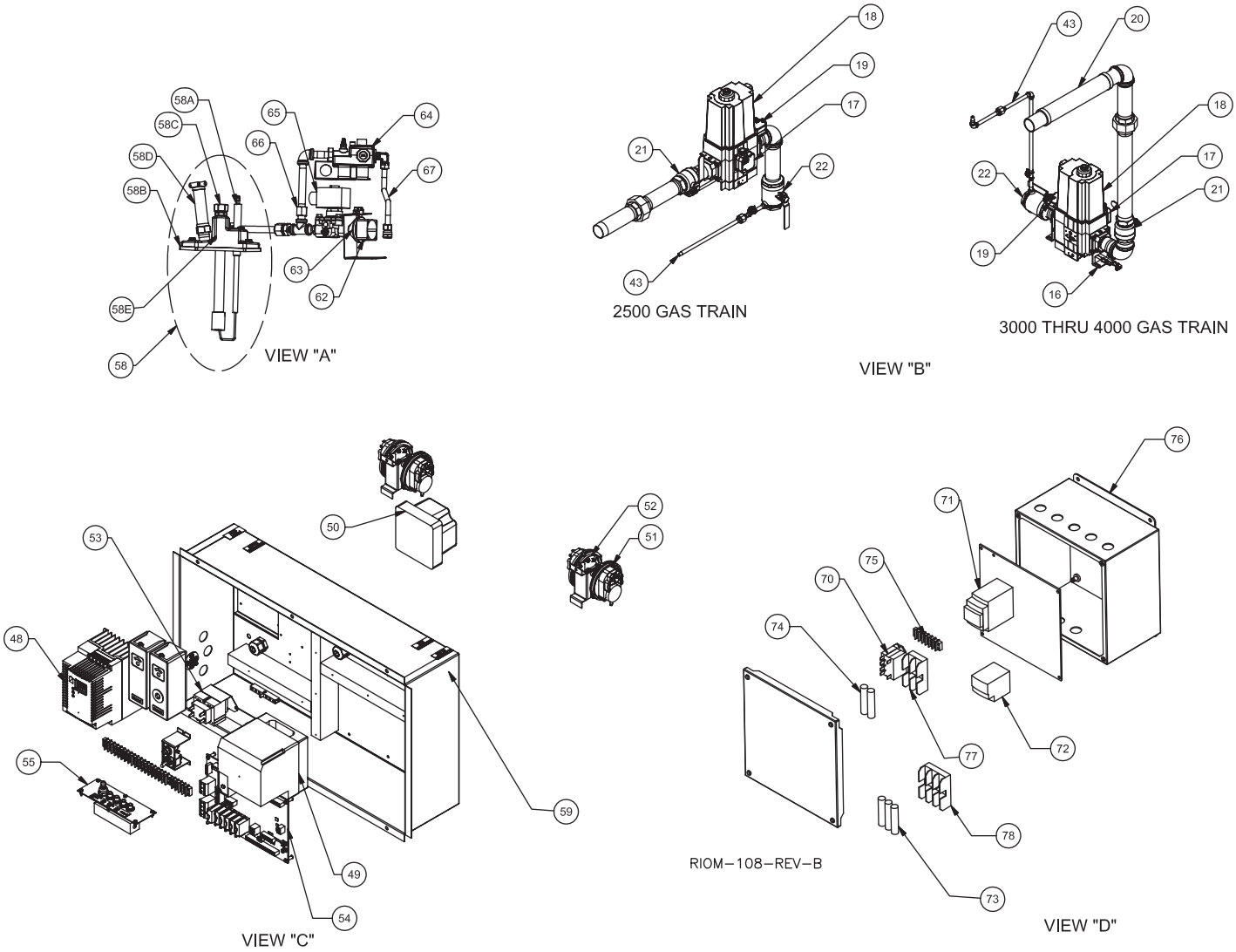
REPAIR PARTS

Figure 24 Exploded view



REPAIR PARTS *(CONTINUED)*

Figure 25 Figure 20 – Electrical components



REPAIR PARTS *(CONTINUED)*

			Model Size with item Quantities Below			
Ref #	**Name of Part**	**Part #**	**2500**	**3000**	**3500**	**4000**
1	Top/Bottom X Profile	04-0524	3	3	3	3
2	Middle X Profile	04-0526	2	2	2	2
3	Top Y Profile	04-0530	4	4	4	4
4	Bottom Y Profile	04-0535	4	4		
		04-0537			4	4
5	Top/Bottom Z Profile	04-0539	4	4	4	4
6	Middle Z Profile	04-0541	2	2	2	2
7	Bottom/Front X Profile	04-0528	1	1	1	1
8	Frame Corner	20-0053	8	8	8	8
9	Frame Corner	04-0543	1	1	1	1
10	Crosses	20-0054	4	4	4	4
11	Drilled Crosses	04-0544	1	1	1	1
12	Bottom Corner	04-0542	4	4	4	4
13	Base Legs Left Side	04-1018	1	1	1	1
	Base Legs Right Side	04-1022	1	1	1	1
15	Burner	10-0322	1			
		10-0297		1		
		10-0323			1	
		10-0300				1
15a	Burner O'ring	06-0006	1	1	1	1
15b	Burner Gasket	06-0038	1	1	1	1
16	Gas Support Bracket	03-3768	2	2	2	2
17	High Gas Pressure Switch (Manual Reset)	11-0421	1	1	1	1
18	Gas Valve, MBC		1			
		11-0223		1		
		11-0218			1	1
NS	Flange 1 1/2"		2			
	Flange 2"	11-0219		2	2	2
19	Low Gas Pressure Switch (Manual Reset)	11-0422	1	1	1	1
20	Gas Hose	53-4001	N/A	1	1	1
21	Firing Valve, 1 1/2"	11-0458	1			
	Firing Valve, 2"	11-0459		1	1	1
22	"A" Valve, 1 1/2"	11-0467	1			
	"A" Valve, 2"	11-0454		1	1	1
23	Blower	12-0019	1	1	1	1
NS	Pilot Flame Disc	10-0141	1	1	1	1
24	Air/Gas Mixing Box Assembly	70-3643	1			
		70-3610		1	1	1
NS	Gas Manifold	01-0207	1			
		01-0203S		1	1	1

REPAIR PARTS *(CONTINUED)*

			Model Size with item Quantities Below			
Ref #	**Name of Part**	**Part #**	**2500**	**3000**	**3500**	**4000**
NS	Manifold/Orifice Mounting Plate (Forward)	03-3734	1			
		03-3721		1	1	1
	Manifold/Orifice Mounting Plate (Rear)	03-3728		1	1	1
25	Mixing Box Gasket	06-0080	1	1	1	1
NS	Gas Injectors, NG	10-1005	1			
		10-1002		2	2	2
26	Flow Switch	14-0203	1	1	1	1
27	Jacket Top Panel	70-2413.1	1	1	1	1
NS	Jacket Top Panel (Outdoor)	70-3640				
28	Air Filter	09-0485	1	1	1	1
29	Rear Pipe Enclosure Assembly	70-3510	1	1	1	1
30	Lower Rear Jacket Panel	03-3786	1			
		03-3787		1		
		03-3788			1	
		03-3789				1
NS	Rear Panel (Outdoor)	03-3810	1			
		03-3811		1	1	1
NS	Left Hand Rear Panel (Outdoor)	70-4113	1			
		70-4115		1	1	1
31	Upper Left Jacket Panel	03-2832	1	1	1	1
32	Upper Right Jacket Panel	03-2834	1	1	1	1
NS	Upper Right Jacket Panel (Outdoor)	70-4131	1	1	1	1
33	Lower Left & Right Jacket Panel	03-2838	2			
		03-2839		2		
		03-2840			2	
		03-2841				2
34	Upper Front Jacket Panel	70-3617	1	1	1	1
NS	Upper Front Panel (Outdoor)	70-2443				
NS	Handle	20-0063	1	1	1	1
35	Lower Front Jacket Panel	70-3535	1			
		70-3536		1		
		70-3537			1	
		70-3538				1
NS	Lower Front Jacket Panel (Outdoor)	70-3565	1			
		70-3568		1	1	1
36	Combustion Chamber Top Panel	70-3561	1	1	1	1
	Manning Glass Insulation (per square foot)	05-0104	9	9	9	9

REPAIR PARTS *(CONTINUED)*

			Model Size with item Quantities Below			
Ref #	**Name of Part**	**Part #**	**2500**	**3000**	**3500**	**4000**
37	Combustion Chamber Rear/Side Panel	70-3566	1			
		70-3567		1		
		70-3568			1	
		70-3569				1
	Manning Glass Insulation (per square foot)	05-0104	24	24	26	26
38	Combustion Chamber Door Assembly	70-3572	1			
		70-3573		1		
		70-3574			1	
		70-3575				1
	Manning Glass Insulation (per square foot)	05-0104	7	7	7	7
39	Pressure Relief Valve 50#	30-0384	1	1	1	1
	Pressure Relief Valve 125#	13-0053	1	1	1	1
NS	Latch	20-0045	2	2	2	2
41	Drain Valve Assembly (MB)	70-2562	1	1	1	1
	Drain Valve Assembly (MW)	70-2564	1	1	1	1
NS	Drain Valve Gaskets	06-0084	1	1	1	1
43	External Pilot Train Assembly		1			
		70-3655		1	1	1
NS	Ball Valve	11-0395	1	1	1	1
44	Tridicator 30 - 60 psi	13-0308	1	1	1	1
	Tridicator 75 - 160 psi	13-0305	1	1	1	1
45	LWCO #550LSV	14-0256	1	1	1	1
46	Heat Exchanger Assembly (Copper)	70-3584.1	1			
	Cast Iron	70-3585.1		1		
		70-3586.1			1	
		70-3587.1				1
	Heat Exchanger Assembly (Copper)	70-3576.1	1			
	Bronze	70-3577.1		1		
		70-3578.1			1	
		70-3579.1				1
	Heat Exchanger Assembly (Cupronickel)	70-3588.1	1			
	Cast Iron	70-3589.1		1		
		70-3590.1			1	
		70-3591.1				1
	Heat Exchanger Assembly (Cupronickel)	70-3580.1	1			
	Bronze	70-3581.1		1		
		70-3582.1			1	
		70-3583.1				1
47	Header Gasket	06-0062	2	2	2	2

REPAIR PARTS *(CONTINUED)*

			Model Size with item Quantities Below			
Ref #	**Name of Part**	**Part #**	**2500**	**3000**	**3500**	**4000**
48	Frequency Drive	15-0230	1	1	1	1
49	Flame Safeguard, RM7895C	16-0024R	1	1	1	1
50	Spark Ignitor	16-0008	1	1	1	1
51	Air Pressure Switch	11-0419	1	1	1	1
52	Fan Prove Switch	11-0420	1	1	1	1
		11-0419	1	1	1	1
NS	Mounting Bracket	03-3752	1	1	1	1
53	Transformer, 50 VA	15-0007	1	1	1	1
NS	High Limit, Jumo, (MB)	14-0013	1	1	1	1
NS	High Limit, Jumo, (MW)	14-0014	1	1	1	1
NS	High Limit, Jumo, (MB) Auto Reset	14-0114	N/A	1	1	1
NS	High Limit, Jumo, (MW) Auto Reset	14-0115	N/A	1	1	1
NS	Thermometer Well, 3/8 x 2	13-0102	1	2	2	2
NS	High Limit Well, 3/8 x 3	13-0104	1	2	2	2
NS	Alarm Button	48-0003	1	1	1	1
NS	Alarm/Toggle Bracket	03-3754	1	1	1	1
NS	Terminal Block 6P	48-0157	1	1	1	1
NS	Terminal Block 18P	48-0159	1	1	1	1
NS	Relay, 2P, 24V (optional)	15-0121	1	1	1	1
NS	Relay, 2P, 120V (optional)	15-0127	1	1	1	1
54	Main Board	16-0038	1	1	1	1
NS	Display Board	40-0088	1	1	1	1
NS	Ignition Cable	44-0063	1	1	1	1
NS	Ribbon Cable	40-0115	1	1	1	1
NS	Power Switch	48-0013	1	1	1	1
NS	Toggle Switch	48-0014	1	1	1	1
NS	10K Temperature Sensor	14-0325	3	3	3	3
55	Service Valve Assembly	70-3669	1	1	1	1
NS	Purge Timer, ST7800	16-0007	1	1	1	1
NS	Keyboard Display Module, S7800A	16-0010	1	1	1	1
NS	Ferrite Clamp	16-0032	1	1	1	1
58	Pilot/Flame Rod Kit	70-3615	1	1	1	1
58a	Electrode	16-0335	2	2	2	2
58b	O'ring	06-0008	1	1	1	1
58c	View Port Assembly	70-2205	1	1	1	1
58d	Mini Peeper, C7027A	16-0009	1	1	1	1
58e	Pilot Block	01-0205	1	1	1	1
NS	UV Amplifier, R7849B	16-0037	1	1	1	1
NS	Base, Q7800A	16-0003	1	1	1	1

REPAIR PARTS *(CONTINUED)*

			Model Size with item Quantities Below			
Ref #	**Name of Part**	**Part #**	**2500**	**3000**	**3500**	**4000**
59	Control Box Panel	70-3609	1	1	1	1
60	Collar Fan Transition	01-0201S	1	1	1	1
60a	Gasket	06-0004	1	1	1	1
60b	Fan Hold Down Plate	04-0596	1	1	1	1
62	Mini Fan	12-0021	1	1	1	1
63	Air Funnel	04-1016	1	1	1	1
64	Solenoid Valve w/Regulator, NG	11-0372	1	1	1	1
	Solenoid Valve w/Regulator, LP	11-0374	1	1	1	1
65	Air Shut Off Valve	11-0376	1	1	1	1
66	Pilot Orifice, .052 NG	10-0140	1	1	1	1
	Pilot Orifice, .040 LP	10-0139	1	1	1	1
67	Pilot Tube	62-0102	2	2	2	2
69	Gas Train Stand	70-3651	1	1	1	1
70	Power Relay	15-0118	1	1	1	1
71	Pump Contactor 3PH	15-0211	1	1	1	1
72	Relay Overload (5.5 - 8 Amp)	15-0214	1	1	1	1
	Relay Overload (9 - 13 Amp)	15-0215	1	1	1	1
	Relay Overload (2.5 - 4 Amp)	15-0216	1	1	1	1
	Relay Overload (4 - 6 Amp)	15-0217	1	1	1	1
	Relay Overload (12 - 18 Amp)	15-0219	1	1	1	1
73	Fuse, 2HP, 230V (pump)	48-0626	3	3	3	3
	Fuse, 3HP, 230V (pump)	48-0627	3	3	3	3
	Fuse, 2HP, 460V (pump)	48-0624	3	3	3	3
	Fuse, 3HP, 460V (pump)	48-0625	3	3	3	3
	Fuse, 5HP, 460V (pump)	48-0631	3	3	3	3
74	Fuse, 25Amp, 600V (VFD)	48-0622	2	2	2	2
75	Terminal Strip 6P	48-0162	1	1	1	1
76	Power Service Box	48-0441	1	1	1	1
77	Fuse Block 2P	48-0641	1	1	1	1
78	Fuse Block 3P	48-0642	1	1	1	1
79	Keypad Overlay	82-0189	1	1	1	1
NS	Rating Plate	82-0054	1	1	1	1
NS	Futera III Overlay	82-0192	1	1	1	1
NS	Paint	66-0013	1	1	1	1
NS	Silicone	66-0151	1	1	1	1
NS	Vent Termination Hood 8"	09-0113	1	1		
	Vent Termination Hood 10"	09-0115			1	1
NS	Air Intake Hood 8"	09-0103	1	1		
	Air Intake Hood 10"	09-0104			1	1

START-UP REPORT

DATE:	**JOB NAME:**
TECHNICIAN:	**LOCATION:**
COMPANY:	**MODEL:**
PHONE NUMBER:	**SERIAL #:**

PRE-STARTUP CHECK LIST

- ❑ **NO VISIBLE DAMAGE TO UNIT**
- ❑ **PIPING PROPERLY CONNECTED**
- ❑ **BOILER CIRCULATOR WIRED**
- ❑ **VENT/STACK CONNECTED**
- ❑ **INLET AIR FILTER INSTALLED AND CLEAN**
- ❑ **PROPER SERVICE CLEARANCES PROVIDED**
- ❑ **PUMP RUNNING, HEAT EXCHANGER FULL**
- ❑ **GAS LINES PURGED, NO LEAKS, NO MISSING TEST PLUGS**

BOILER STARTUP SEQUENCE

Note: Locate the AA terminals and minimum hold switch in the bottom-right of the electrical panel on the main HeatNet board. Also locate the manometer test manifold in the bottom of the electrical panel.

1. Disable any external call for heat and toggle the remote/local switch to REMOTE.
2. Toggle the LOW FIRE switch to cycle the boiler then hold at trial for pilot ignition.
3. Set pressure to 3–3.5" w.c. (flame signal should read 5.0 VDC).
4. Release boiler to main flame trial for ignition.
5. Check for stable flame.
6. Record combustion and pressure signal (Ps) at minimum firing rate. (Reference XLF Boiler IOM.)
7. Jumper the AA terminals to force 100% input.
8. Record combustion and pressure signal (Ps). (Reference XLF Boiler IOM.)
9. Remove the AA jumper to place the boiler at minimum rate.
10. Record combustion and pressure signal (Ps). (Reference XLF Boiler IOM.)
11. Check all combustion results using a calibrated flue gas analyzer.
12. Release the LOW FIRE switch to place boiler in standby.

NOTICE In addition to completing the Futera XLF start-up report, complete the control set-up information in the rear of the Futera XLF Control Installation and operation manual.

COMBUSTION ANALYSIS	MINIMUM FIRING RATE	100% FIRING RATE
GAS PRESSURE AT ELBOW TEST PORT	INCHES W.C.	INCHES W.C.
CO_2	%	%
O_2	%	%
CO (PPM)	PPM	PPM
NET STACK TEMPERATURE	°F	°F
PRESSURE SIGNAL (Ps)	INCHES W.C.	INCHES W.C.

SAFETY TEST CHECKLIST

- ❑ FLOW SWITCHES
- ❑ AIR SWITCH
- ❑ FLAME SAFEGUARD
- ❑ LOW WATER CUT-OFF
- ❑ HIGH LIMITS

NOTICE Verify that the piping and controls ensure the boiler return water temperature does NOT drop below 140 °F, 60 °C. Operating at lower return temperatures is likely to cause condensation in the primary heat exchanger, resulting in corrosion and possible failure of the heat exchanger.

COMMISSIONING THE BOILER/WATER HEATER

- ❑ UNIT CYCLED MINIMUM OF 15 TIMES
- ❑ CUSTOMER INSTRUCTED
- ❑ ALL COVERS REPLACED
- ❑ CUSTOMER GIVEN MANUAL
- ❑ TARGET TEMPERATURE SET PER CUSTOMER

COMMISSIONED BY: _____
(SIGNATURE)

DATE: _____

THE DELTA T BETWEEN THE HEATER INLET AND OUTLET IS CRITICAL TO PROPER FLOW. BEFORE YOU LEAVE THE JOBSITE, YOU MUST RECORD THE DELTA T. THIS READING SHOULD NOT EXCEED 35°F, 19.4°C, NOR BE LOWER THAN 20°F, 11.1°C.

DELTA T = [ ]

ADDITIONAL NOTES AND COMMENTS

NOTICE! Commonwealth of Massachusetts Installation Requirements

MACODE-3

NOTICE In the Commonwealth of Massachusetts, the installation must be performed by a licensed plumber or gas fitter.

1. For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade, in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:
   d. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
      i. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
      ii. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
   e. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
   f. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".
   g. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

WARNING Improper venting can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

2. Exemptions — The following equipment is exempt from 248 CMR 5.08(2)(a) 1 through 4:
   a. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
   b. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.
3. MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM PROVIDED.
   a. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:
      i. Detailed instructions for the installation of the venting system design or the venting system components; and
      ii. A complete parts list for the venting system design or venting system.
4. MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.
   a. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:
      i. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
      ii. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.
5. A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

WARNING Improper venting can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

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LIMITED WARRANTY

Boilers/Water Heaters
Industrial, Commercial and Other Non-Residential Use

The "Manufacturer" warrants to the original owner at the original installation site that the heat exchanger of the Industrial, Commercial, and other Non-Residential Use Boiler (the "Product") will be free from defects in material or workmanship for ten (10) years from the date of installation. Additional twenty one (21) year thermal shock warranty on heat exchanger. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective. All other RBI supplied Boiler/Water Heater parts are warranted against defects in material and workmanship for one (1) year from date of installation or 18 months from date of shipment from RBI.

The "Manufacturer" warrants to the original owner at the original installation site that the heat exchanger of the Industrial, Commercial, and other Non-Residential Use Water Heater (the "Product") will be free from defects in material or workmanship for five (5) years from the date of installation. Additional twenty one (21) year thermal warranty on heat exchanger. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective. All other RBI supplied Boiler/Water Heater parts are warranted against defects in material and workmanship for one (1) year from date of installation or 18 months from date of shipment from RBI.

This limited warranty does not apply:

(a) if the Product has been subjected to misuse or neglect, has been accidentally or intentionally damaged, has not been installed, maintained or operated in accordance with the furnished written instructions, or has been altered or modified in any way.
These include but not limited to:
- Excessive water hardness causing a lime build-up in the heat exchanger tubes is not a fault of the equipment and is not covered under the manufacturer's warranty.
- Excessive pitting and erosion on the inside of the heat exchanger tubes caused by high water velocity through the tubes and is not covered by the manufacturer's warranty. (See Installation Instructions for proper pump performance.)
- Chemical corrosion, no corrosive chemical (freon, dry cleaning chemicals, degreasing liquids, chlorine or any chemicals that produce hydrochloric acid) can be present in the boiler room as it rapidly destroys the heating equipment and voids the warranty.
- All copper fin boilers should not operate with a return water temperature less than 110°F, 43°C atmospheric combustion, 125°F, 52°C fan assist combustion. If a lower temperature is required, an external bypass should be installed to prevent condensation. The manufacturer's warranty does not cover damage done by condensation.

(b) to any expenses, including labor or material, incurred during removal or reinstallation of the Product or parts thereof.

(c) to damage as a result of settlement, distortion, collapse, or cracking of any foundation area, beams or pipes surrounding the Product.

(d) to any workmanship of any installer of the Product; or to Products installed outside the continental United States or Canada.

This limited warranty is conditional upon:

(a) shipment, to the Manufacturer, of that part of the Product thought to be defective. Goods can only be returned with prior written approval from the Manufacturer. All returns must be freight prepaid.

(b) determination in the reasonable opinion of the Manufacturer that there exists a defect in material or workmanship.

Repair or replacement of any part under this Limited Warranty shall not extend the duration of the warranty with respect to such repaired or replaced part beyond the stated warranty period.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, AND ALL SUCH OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS LIMITED WARRANTY. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE IN ANY WAY FOR ANY CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OF ANY NATURE WHATSOEVER, OR FOR ANY AMOUNTS IN EXCESS OF THE SELLING PRICE OF THE PRODUCT OR ANY PARTS THEREOF FOUND TO BE DEFECTIVE. THIS LIMITED WARRANTY GIVES THE ORIGINAL OWNER OF THE PRODUCT SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY BY EACH JURISDICTION.

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